

RCN: 279186.0701

DRAFT FINAL

**ENVIRONMENTAL ASSESSMENT FOR
THE PROPOSED MOTOR TREATMENT AREA
UTAH TEST AND TRAINING RANGE**

March 2000

Prepared for:

Ms. Kay Winn
OO-ALC/EMP
7274 Wardleigh Road
Hill AFB, UT 84056-5137

USAF Contract No.: F42650-92-D-0007
Delivery Order No.: 5086

Prepared by:

Radian International
4021 South 700 East, Suite 600
Salt Lake City, UT 84107

Finding of No Significant Impact for the Proposed Motor Treatment Area at Utah Test and Training Range - North

Description of the Proposed Action

Due to the Strategic Arms Reduction Treaties (START and START II), as well as the overall arms reduction goals of the military, the Department of Defense (DoD) demilitarization workload is increasing. Construction and maintenance of new storage magazines to accommodate the large rocket motors being removed from service would be extremely expensive, but more importantly, it is safer to treat these motors rather than store them and risk the possibility of accidental ignition (e.g., by fire or lightning strike).

Consistent with international treaties and the DoD demilitarization program, the Navy began eliminating the Trident I (C-4) missiles in 1999. This elimination is scheduled to be complete by 2015. Hill Air Force Base (AFB) is currently treating the first and second stages of these missiles for the Navy at the existing Thermal Treatment Unit (TTU) at the Utah Test and Training Range-North (UTTR-North). However, because of existing environmental regulatory limitations and operational constraints, the existing TTU does not have sufficient operational flexibility to handle the anticipated increase in the DoD demilitarization workload in a timely manner. Therefore, another treatment option must be made available.

The proposed action would consist of constructing a new treatment unit, known as the Motor Treatment Area (MTA), at one of four alternative locations on UTTR-North. The treatment unit would have the capability to treat up to 80,000 pounds net explosive weight (NEW) of Class 1.1 rocket motor propellant by open detonation (OD) and up to 100,000 pounds NEW of Class 1.3 propellant by open burn (OB). Conducting test detonations at any of the four alternative sites is also included under the proposed action. The alternative locations evaluated for this Environmental Assessment (EA) include the CBU Valley site, the Doyle's Gulch site, the M-60 Range site, and the Round Mountain site.

The no-action alternative was also evaluated and would not result in any changes to the facilities at UTTR-North. Under this alternative, the increased OB/OD workload would have to be conducted at the existing TTU facility as operations permit. Although the number of treatment days per year would not be expected to increase, the treatment events would occur over a longer period of time, resulting in longer stockpiling of munitions. In addition, under current permit conditions, rocket motors larger than 42,000 pounds NEW of Class 1.1 propellant could not be treated at the TTU.

Summary of Environmental Impacts of Alternative Actions

Surface Water

No significant impacts to surface water quality at UTTR-North are expected as a result of MTA construction or operation at any of the four alternative action sites. The general scarcity of surface water in the immediate vicinity of the sites makes adverse impacts unlikely.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to surface water are expected as a result of the no-action alternative.

Groundwater

Conducting MTA operations at any of the four alternative MTA locations would require development of a groundwater well to provide water for dust suppression during MTA operations. Water usage is estimated at approximately 8,000 gallons per detonation and 3,000 gallons per burn. It is not anticipated that these activities would result in any significant adverse impact to groundwater quality.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to groundwater are expected as a result of the no-action alternative.

Geology and Soils

Impacts to geology and soils at all four alternative action locations would result directly from open detonation of rocket motors. Detonating motors results in ejecting soil, which creates a large crater. Ejected soils are used to backfill the crater. Surrounding native soils could be used if necessary. It is not anticipated that these activities would result in any significant adverse impacts.

Part of the explosive energy from a detonation is transmitted to the ground in the form of stress waves. Modeling of the proposed MTA operations indicates the seismic impacts associated with these detonations would not result in significant adverse impact to the surrounding geology for any of the alternative action locations.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to geology or soils are expected as a result of the no-action alternative.

Vegetation

The proposed action would result in removing vegetated areas to develop a 4,000 square foot pad and to develop access roads. This action is not anticipated to have a significant adverse impact on vegetation in the area. At all four alternative action locations, vegetation removed as a result of construction activities would consist of native grasses and shrubs, none of which are designated as endangered plant species.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to vegetation are expected as a result of the no-action alternative.

Wetlands

It is not anticipated that there would be any significant adverse impacts to wetlands as a result of MTA development or operation at the alternative action locations. For all alternatives, no activities associated with the MTA development or operations would occur near existing wetlands.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to wetlands are expected as a result of the no-action alternative.

Wildlife

Fifteen active golden eagle nesting territories have been identified within a 10 mile radius of the alternative MTA locations. The existence of mating pairs of golden eagles on the range has raised concerns regarding the possible impact of OB/OD operations on their habitat and behavior. Currently, it is unknown whether MTA operations would have a detrimental impact on the eagles, and what distance from the disturbance to the eagles would be considered acceptable. The United States Fish and Wildlife Service (USFW) and the Utah Division of Wildlife Resources (DWR) have stated that, if MTA operations are less than two miles from an active eagles' nest and in direct line-of-sight, then a study must be conducted to determine impacts to the eagles courtship/nesting activities. A distance less than 2 miles may be acceptable if significant terrain features remove MTA operations from the direct line-of-sight. Hill AFB is working with the DWR to develop a two-year study to evaluate the potential impacts of OB/OD activities on eagles' mating, nesting, and breeding activities. This study will be conducted regardless of which alternative MTA site is selected.

One active golden eagle nest has been identified approximately 1.6 miles away from the CBU Valley alternative MTA site. This nest is out of direct line-of-sight due to an elevation obstruction of 26 meters. A second nest has been located approximately 1.3 miles from this site and it is in direct line-of-sight. It is not known if OB/OD activities would have a significant adverse impact on any of these eagles, however impacts would be monitored in cooperation with the DWR. If adverse impacts were observed (i.e. take, molest, or disturb), mitigation efforts would be employed, or MTA operations at the site would be terminated. It is not anticipated that there would be significant adverse impacts to other wildlife under this alternative.

Active golden eagle nests have been identified near the Doyle's Gulch alternative MTA site, approximately 1.3 miles away, and in direct line-of-sight. Potential impacts to these eagles would be monitored in cooperation with the DWR. As with the CBU Valley alternative, if adverse impacts are observed, either mitigation efforts would be employed or MTA operations would be discontinued at this site.

The nearest known active golden eagles' nest to the M-60 Range alternative MTA site is approximately one mile away and in direct line-of-sight. In addition, a significant prey base of jackrabbits and other rodents is found in the immediate area. Potential impacts to the prey base could, in turn, impact the feeding of the neighboring eagles. The planned eagle study would also evaluate MTA impacts on prey populations. As with the previous alternatives, if adverse impacts are observed, either mitigation efforts would be employed or MTA operations would be discontinued at this site.

An active golden eagles' nest is located approximately 1.75 miles north of the Round Mountain site, out of direct line-of-sight. Impacts to these eagles will be monitored as stated previously; however, due to the distance from the nest and the significant terrain features, it is not anticipated that MTA operations at this site would have a significant adverse impact on the resident eagle population. In addition, no significant adverse impacts to other wildlife are anticipated under this alternative action.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to wildlife or habitat are expected as a result of the no-action alternative.

Air Quality

Air dispersion modeling conducted for MTA operations have indicated that there would be no adverse impacts to air quality. Based on the modeling, MTA operations at any of the alternative action sites are not expected to create a violation of ambient air quality standards or pose any threat to public health.

Under the no-action alternative, there would be no increase in annual emissions at UTTR-North. No significant impacts to air quality are expected as a result of the no-action alternative.

Archaeological, Historical, and Cultural Resources

Two archaeological sites have been identified within 0.25 miles of the CBU Valley alternative MTA location. If this location were selected, the sites would need to be tested for significance prior to the start of MTA construction and operation. Any substantial subsurface cultural deposits identified during testing would be mitigated prior to the start of routine OB/OD operations. If mitigation procedures are followed, including submittal of a mitigation plan to the State Historic Preservation Office (SHPO), no significant adverse impacts are anticipated.

Operation of the MTA at the Doyle's Gulch site has the potential to have significant adverse impacts on the cultural resources at the rock outcrop located approximately 0.5 miles from the site. Prior

to commencing MTA operations at the Doyle's Gulch site, further study of the cultural significance of this site would be required, and, if found to be significant, the archaeological site would require mitigation. Provided data collection and recovery is performed in accordance with approval from the SHPO, no adverse impacts to cultural resources are expected from this alternative.

No significant archaeological, historical, or cultural sites have been identified in the vicinity of the M-60 Range site or the Round Mountain site. It is not anticipated that MTA operations would result in any adverse impacts to cultural resources conducted at either of these two sites. However, an archaeologist would be on-site during the extensive construction activities associated with the Round Mountain alternative (i.e. power line burial or relocation).

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to archaeological or cultural resources are expected as a result of the no-action alternative.

Land Use

It is not expected that MTA operations at any of the alternative action locations would result in significant adverse impacts to land use at UTTR-North. MTA operations at all four sites would be consistent with the current designated use of UTTR-North.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to UTTR-North land use are expected as a result of the no-action alternative.

Noise

MTA operations at any of the alternative action locations are not expected to result in significant increased impact on noise levels in the area surrounding the UTTR-North. Noise modeling would be conducted prior to each detonation to ensure that predicted off-site noise levels in populated areas would not exceed 134 dB. If modeling showed that noise levels to off-site receptors would be above this level, OD activities would not occur. Similar noise modeling currently conducted for TTU operations has been very successful at minimizing noise impacts to off-site human receptors.

The no-action alternative would result in no changes to existing facilities at UTTR-North, however additional OB/OD operations could take place at the TTU. It is not anticipated that these activities would result in any significant adverse impacts because the current noise mitigation plan would continue to be used.

Health and Safety

It is not expected that the proposed action would result in significant adverse health and safety impacts, regardless of which alternative MTA location is selected. A health risk assessment performed for the proposed MTA development indicates that acceptable human health and ecological risk thresholds would not be exceeded by MTA operations. MTA operations would be conducted similarly to existing TTU operations; therefore, only minor modification to existing operating procedures would be required.

For safety reasons, development of the MTA at the Round Mountain site would require the relocation or burying of approximately 1.7 to 2.1 miles of above-ground high-voltage power line, due to the proximity to the proposed pad. Necessary safety factors would have to be considered in the relocation of these power lines.

Under the no-action alternative, it is likely that operating limitations at the TTU would result in increased storage requirements for demilitarized munitions. The no-action alternative could potentially

result in significant adverse impacts to health and safety due to the hazards associated with motor storage, which include accidental ignition due to fires, lightning strikes, and other unanticipated events.

Transportation

It is not expected that MTA operations at the alternative action locations would result in significant adverse impacts to transportation. Some road closures would be required during MTA operations (similar to current practice) for all four locations. These closures would be limited to roads within the UTTR-North boundary and would only be required during actual motor treatment activities. Some road development would be necessary for all four alternative locations to accommodate MTA access and motor transportation. In particular, the Round Mountain alternative would require extensive road reconstruction on approximately 4 miles of existing asphalt road. However, none of these developments are anticipated to result in adverse impacts to transportation on the range.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No significant impacts to transportation are expected as a result of the no-action alternative, however prolonged operation of the TTU would require continued closure of the county road during TTU operations.

Socioeconomics

MTA development and operations at any of the four alternative locations would not have a significant impact on the local economy or employment.

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impacts to local socioeconomic conditions are expected as a result of the no-action alternative.

Environmental Justice

Environmental justice analyses for NEPA documents attempt to determine whether a proposed action disproportionately impacts minority and poor populations. However, because the UTTR-North is not located adjacent to such groups and because the proposed action does not result in significant adverse impacts, no such analysis was conducted.

Conclusion

Currently it is unknown whether MTA operations would have a detrimental impact on golden eagles at UTTR-North. It is also unknown what distance from the MTA disturbance to the eagles would be considered acceptable. Due to the visual impacts and the increased proximity of the CBU Valley, Doyle's Gulch, and M-60 Range alternative MTA sites to the golden eagles' nests, it is believed that these alternatives may have a more significant impact on the golden eagles than the Round Mountain alternative MTA site. Both the DWR and the USFW Service recognize the opportunity to gain knowledge of raptor tolerance levels by studying the eagles' behavior during detonation activities. Therefore, they are working in conjunction with the Hill AFB Natural Resource Program Manager to develop a two-year study to determine how MTA operations, including increased vehicular traffic and increased human activity at the site, would affect the eagles' mating, nesting, and breeding activities. This study will be implemented regardless of which alternative MTA site is selected. If detrimental impacts were observed any time during the study, mitigation efforts would be employed or, if necessary, MTA operations would be discontinued at the site.

Other than the potential adverse impacts to eagles mentioned above, no significant impacts are expected due to the development of an MTA at any of the alternative locations. Referenced potential impacts to identified archaeological sites could be mitigated if study results indicate that it is necessary.

Therefore, in accordance with Air Force Instruction 32-7061, a Finding of No Significant Impact (FONSI) may be issued, and preparation of an Environmental Impact Statement (EIS) is not necessary.

Hill Air Force Base, Utah

Authorized Signature

Date

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	ES-1
1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION	1-1
1.1 Introduction	1-1
1.2 Background	1-1
1.3 Need for the Proposed Action	1-4
1.4 Applicable Requirements	1-6
1.4.1 National Environmental Policy Act Requirements for Air Force Actions	1-6
1.4.2 Air Quality Requirements.....	1-7
1.4.3 RCRA Requirements.....	1-7
1.4.4 Transportation Requirements.....	1-7
1.4.5 Noise Emission Requirements	1-7
1.4.6 Natural Resource Requirements.....	1-7
1.4.7 Cultural Resource Requirements	1-8
1.5 Scope and Organization of This Document	1-8
2.0 DESCRIPTION OF PROPOSED ACTION ALTERNATIVES	2-1
2.1 Wastes to be Treated.....	2-1
2.2 Treatment Technologies.....	2-1
2.2.1 Propellant Burning/Detonation While in Motor Casing.....	2-1
2.2.2 Propellant Removal Technologies	2-2
2.2.3 Propellant Treatment and Disposal Technologies.....	2-2
2.3 Formulation of Alternatives	2-3
2.3.1 Treatment Method Selection Criteria	2-3
2.3.2 Site Selection Criteria.....	2-4
2.3.3 Sites Eliminated From Further Consideration	2-5
2.4 Description of Alternatives	2-5
2.4.1 Description of the CBU Valley Site Alternative Action Site.....	2-5
2.4.2 Description of the Doyle's Gulch Alternative Action Site.....	2-7
2.4.3 Description of the M-60 Range Alternative Action Site	2-9
2.4.4 Description of the Round Mountain Alternative Action Site	2-11
2.4.5 Description of the No-Action Alternative	2-11
3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT.....	3-1
3.1 Surface Water.....	3-1
3.2 Groundwater.....	3-1
3.3 Geology and Soils.....	3-2
3.3.1 CBU Valley Alternative Action.....	3-2
3.3.2 Doyle's Gulch Alternative Action	3-2
3.3.3 M-60 Range Alternative Action.....	3-2
3.3.4 Round Mountain Alternative Action.....	3-3
3.4 Vegetation	3-3
3.5 Wetlands	3-4
3.6 Wildlife	3-4

TABLE OF CONTENTS (Continued)

	Page
3.7 Air Quality	3-4
3.8 Archaeological, Historical, and Cultural Resources	3-5
3.9 Land Use	3-5
3.10 Noise	3-5
3.11 Health and Safety.....	3-6
3.12 Transportation	3-6
3.13 Socioeconomic Conditions.....	3-7
 4.0 ENVIRONMENTAL CONSEQUENCES	 4-1
4.1 Surface Water.....	4-1
4.2 Groundwater.....	4-2
4.3 Geology and Soils.....	4-2
4.3.1 Soils.....	4-2
4.3.2 Seismic Considerations	4-3
4.4 Vegetation	4-4
4.5 Wetlands	4-5
4.6 Wildlife	4-5
4.7 Air Quality	4-7
4.8 Archaeological, Historical, and Cultural Resources	4-8
4.9 Land Use	4-10
4.10 Noise	4-11
4.11 Health and Safety.....	4-14
4.12 Transportation	4-15
4.13 Socioeconomic Conditions.....	4-16
4.14 Environmental Justice.....	4-16
4.15 Cumulative Impacts	4-16
4.16 Summary of Impacts.....	4-16
 5.0 LIST OF PREPARERS	 5-1
6.0 LIST OF PERSONS CONTACTED.....	6-1
7.0 REFERENCES	7-1

APPENDIX A

Summary of Major Types of Explosives

APPENDIX B

Treatment Technologies Associated with Energetic Waste Treatment

APPENDIX C

Site Photographs of Alternative MTA Locations

TABLE OF CONTENTS

(Continued)

APPENDIX D

Effect of Ground Vibrations from Proposed MTA Operations at UTTR-North

APPENDIX E

Air Impact Modeling Methodology for MTA Operations at UTTR-North

LIST OF FIGURES

	Page
1-1 Utah Test and Training Range - North	1-2
1-2 Location of the Alternative MTA Sites at UTTR-North	1-3
1-3 Trident I (C-4) Missile Stages.....	1-5
2-1 Detail of the CBU Valley Alternative Action Site	2-6
2-2 Detail of the Doyle’s Gulch Alternative Action Site.....	2-8
2-3 Detail of the M-60 Range Alternative Action Site.....	2-10
2-4 Detail of the Round Mountain Alternative Action Site.....	2-12

LIST OF TABLES

	Page
ES-1 Anticipated Environmental Consequences from MTA Operations.....	ES-3
1-1 Rocket Motor Comparison by Stage (Class 1.1).....	1-6
4-1 Estimated Annual Emissions from MTA OB/OD Operations.....	4-8
4-2 Maximum Modeled Concentrations from MTA OB/OD Activities	4-9
4-3 Expected Decibel (dB) Level versus Distance.....	4-13
4-4 Impulse Noise Guidelines.....	4-13
4-5 Anticipated Environmental Consequences from MTA Operations.....	4-18

LIST OF ACRONYMS

AF	United States Air Force
AFI	Air Force Instruction
AO	Air Quality Approval Order
bgs	Below ground surface
BLM	Bureau of Land Management
BOOM	Blast Operational Overexposure Model
C	Centigrade
CFR	Code of Federal Regulations
DAQ	Division of Air Quality
dB	Decibels
DEQ	Department of Environmental Quality
DoD	Department of Defense
DOT	United States Department of Transportation
DSHW	Division of Solid and Hazardous Waste
DWR	Department of Wildlife Resources
EA	Environmental Assessment
EIS	Environmental Impact Statement
F	Fahrenheit
FONSI	Finding of No Significant Impact
HAG	Helicopter Air Gunnery
HAP	Hazardous Air Pollutants
HMX	Cyclotetramethylenetetranitramine
Km	Kilometers
lb	Pound

MBTA	Migratory Bird Treaty Act
mg/L	Milligrams per liter
mm	Millimeter
MSL	Mean sea level
MTA	Motor Treatment Area
NAAQS	National Ambient Air Quality Standards
NCA	Noise Control Act
2-NDPA	Nitrodiphenylamine
NEPA	National Environmental Policy Act
NEW	Net explosive weight
NOI	Notice of Intent
NSWC	Naval Surface Warfare Center
OB/OD	Open Burn/Open Detonation
RCRA	Resource Conservation and Recovery Act
SHPO	State Historic Preservation Office
SIPS	Sound Intensity Propagation System
SO ₂	Sulfur Dioxide
START	Strategic Arms Reduction Treaties
START II	Strategic Arms Reduction Treaties
TNT	Trinitrotoluene
TTU	Thermal Treatment Unit
UAC	Utah Administrative Code
USFW	United States Fish and Wildlife Service
USGS	United States Geologic Survey
UTTR-North	Utah Test and Training Range – North
UXO	Unexploded Ordnance

EXECUTIVE SUMMARY

The Department of Defense (DoD) demilitarization workload is increasing as a result of the Strategic Arms Reduction Treaties (START and START II), as well as overall arms reduction goals of the military. Construction and maintenance of new storage magazines to accommodate the large rocket motors being removed from service would be extremely expensive, but more importantly, it is safer to treat these motors rather than store them and risk the possibility of accidental ignition (e.g., by fire or lightning strike).

As a result of the increasing demilitarization workload, the United States Air Force (AF) has been requested to treat the Navy Trident I (C-4) first and second stage rocket motors at the Utah Test and Training Range-North (UTTR-North). Operations at the existing Thermal Treatment Unit (TTU) at UTTR-North have included treating large missile motors, and the TTU is currently the only facility capable of handling missile motors of this size (greater than 10,000 pounds net explosive weight [NEW]). However, because of existing environmental regulatory limitations and operational constraints, the TTU does not have sufficient operational flexibility to handle the anticipated increase in the DoD demilitarization workload in a time-frame consistent with treaty requirements and acceptable motor shelf-life. Therefore, another treatment option must be made available.

The purpose of this Environmental Assessment (EA) is to evaluate the potential impacts to the environment associated with constructing and operating a second treatment unit or motor treatment area (MTA) at UTTR-North. Various motor treatment technologies were evaluated as part of this EA. The only technology that met the selection criteria was open burn/open detonation (OB/OD) of munitions. Under the proposed action, motors with up to 80,000 pounds NEW of Class 1.1 propellant would be detonated at the MTA. Motors with up to 100,000 pounds NEW of Class 1.3 propellant would be treated by open burning at the MTA. In addition to the Trident I workload, the new MTA would be used to treat other munitions similar to those currently treated at the TTU. In the future, larger rocket motors, such as the Navy's Trident II (D-5) rocket motors may be treated at the MTA as well.

Four alternative locations for the MTA were evaluated as part of this EA. They include the CBU Valley site, the Doyle's Gulch site, the M-60 Range site, and the Round Mountain site. The no-action alternative was also evaluated for this EA. With the no-action alternative, there would be no changes to existing facilities at UTTR-North. Existing operations, and portions of the Trident I workload, would be conducted at the TTU as operational constraints allow, possibly resulting in stockpiling munitions.

Under the proposed action, the issues of greatest potential concern include wildlife, archaeological resources, noise, air quality, and health and safety issues. Impacts to the physical environment, which include surface water, groundwater, geology and soils, and wetlands, would not be significant.

Wildlife concerns center around resident golden eagle populations. It is currently unknown what impacts OB/OD operations would have on the eagles' breeding activities and habitat. A two-year study is being developed in cooperation with the Utah Division of Wildlife Resources (DWR) to monitor impacts from MTA operations on the eagles' courtship/nesting activities as well as impacts to their prey source. If at any time it is determined that MTA operations are having a detrimental impact on the eagles, either mitigation efforts would be employed as appropriate, or, if necessary, MTA operations would be terminated at the site.

Two potentially significant archaeological sites have been identified near the CBU Valley alternative action location, and one potentially significant archaeological site is located near the Doyle's

Gulch alternative action location. The cultural sites will be studied to evaluate the necessity of mitigating possible impacts to buried artifacts due to detonation vibration and increased human traffic in the area.

Noise impacts to off-site receptors from motor treatment activities have been successfully mitigated by not conducting operations when noise modeling predicts noise levels will be greater than 134 decibels (dB) in populated areas. The same practices of noise modeling would be conducted for the proposed action; therefore, noise impacts are not expected to be significant. Air modeling conducted for the proposed MTA operations has indicated that pollutant emissions would not cause air quality standards to be exceeded. No changes to health and safety considerations are expected as a result of MTA development; existing safety procedures would be followed.

Under the no-action alternative, no significant adverse environmental impacts would be expected. However, if the increasing workload resulted in stockpiles of munitions, safety concerns associated with storage of large missile motors, as well as possible START violations, could result.

Table ES-1 summarizes the impacts to the environment associated with MTA development at the alternative MTA locations, and the no-action alternative. Provided mitigation efforts are implemented as discussed in Section 4 of this EA, the proposed action is not expected to have any significant adverse environmental impacts.

Table ES-1. Anticipated Environmental Consequences from MTA Operations

Environmental Issues	CBU Valley Proposed Action	Doyle's Gulch Alternative Action	M-60 Range Alternative Action	Round Mountain Alternative Action	No-Action Alternative
Surface Water	No anticipated impact. There are no surface waters located in the vicinity of the proposed action.	No anticipated impact. There are no surface waters located in the vicinity of the proposed action.	No anticipated impact. There are no surface waters located in the vicinity of the proposed action.	No anticipated impact. There are no surface waters located in the vicinity of the proposed action.	No anticipated impact. There would be no changes to the existing facilities at UTTR-North.
Groundwater	No significant impact to groundwater quality from infiltration due to limited precipitation at the site. A groundwater well would be developed to provide water for dust suppression (approximately 8,000 gallons per detonation and 3,000 gallons per burn).	No significant impact to groundwater quality from infiltration due to limited precipitation at the site. A groundwater well would be developed to provide water for dust suppression (approximately 8,000 gallons per detonation and 3,000 gallons per burn).	No significant impact to groundwater quality from infiltration due to limited precipitation at the site. A groundwater well would be developed to provide water for dust suppression (approximately 8,000 gallons per detonation and 3,000 gallons per burn).	No significant impact to groundwater quality from infiltration due to limited precipitation at the site. A groundwater well would be developed to provide water for dust suppression (approximately 8,000 gallons per detonation and 3,000 gallons per burn).	No anticipated impact. There may be extended use of the TTU for OD activities if the MTA is not developed, but groundwater usage is not expected to exceed current rates.
Geology and Soils	No significant impact. Ejected soils would be used as backfill for detonation craters. Based on the distance to the nearest known potential fault, there are no seismic concerns.	No significant impact. Ejected soils would be used as backfill for detonation craters. Based on the distance to the nearest known potential fault, there are no seismic concerns.	No significant impact. Ejected soils would be used as backfill for detonation craters. Based on the distance to the nearest known potential fault, there are no seismic concerns.	No significant impact. Ejected soils would be used as backfill for detonation craters. Based on the distance to the nearest known potential fault, there are no seismic concerns.	No anticipated impact. There would be no changes to the existing facilities at UTTR-North.
Vegetation	Impacts associated with construction activities in currently undeveloped areas would occur. However, removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the area.	Impacts associated with construction activities on currently undeveloped areas would occur. However, removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the area.	Impacts associated with construction activities on currently undeveloped areas would occur. However, removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the area.	Impacts associated with construction activities on currently undeveloped areas would occur. However, removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the area.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Wetlands	No anticipated impacts. There are no wetlands located in the vicinity of the proposed action.	No anticipated impacts. There are no wetlands located in the vicinity of the proposed action.	No anticipated impacts. There are no wetlands located in the vicinity of the proposed action.	No anticipated impacts. There are no wetlands located in the vicinity of the proposed action.	No impact. There are no wetlands located in the vicinity of the TTU.

Table ES-1. (continued)

Environmental Issues	CBU Valley Proposed Action	Doyle's Gulch Alternative Action	M-60 Range Alternative Action	Round Mountain Alternative Action	No-Action Alternative
Wildlife	Potentially significant adverse impacts to wildlife may occur. However, any mitigation efforts recommended during, or as a result of, the two-year eagle study would be implemented as necessary. Mitigation may include termination of MTA activities at the site, if appropriate.	Potentially significant adverse impacts to wildlife may occur. However, any mitigation efforts recommended during, or as a result of, the two-year eagle study would be implemented as necessary. Mitigation may include termination of MTA activities at the site, if appropriate.	Potentially significant adverse impacts to wildlife may occur. However, any mitigation efforts recommended during, or as a result of, the two-year eagle study would be implemented as necessary. Mitigation may include termination of MTA activities at the site, if appropriate.	No significant adverse impacts to wildlife are expected. Any mitigation efforts recommended during, or as a result of, the two-year eagle study would be implemented as necessary.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Air Quality	No significant adverse impacts to air quality are expected. Air dispersion modeling has shown that neither federal ambient air quality criteria nor state air quality standards would be exceeded from proposed MTA operations.	No significant adverse impacts to air quality are expected. Air dispersion modeling has shown that neither federal ambient air quality criteria nor state air quality standards would be exceeded from proposed MTA operations.	No significant adverse impacts to air quality are expected. Air dispersion modeling has shown that neither federal ambient air quality criteria nor state air quality standards would be exceeded from proposed MTA operations.	No significant adverse impacts to air quality are expected. Air dispersion modeling has shown that neither federal ambient air quality criteria nor state air quality standards would be exceeded from proposed MTA operations.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Cultural Resources	No significant adverse impacts to cultural resources are expected provided that the two nearby archaeological sites are tested for significant subsurface deposits and, if identified, data recovery is performed in accordance with SHPO approval.	No significant adverse impacts to cultural resources are expected provided that the rock shelter is tested for significant subsurface deposits and, if identified, data recovery is performed in accordance with SHPO approval.	No anticipated impacts. No potential cultural resources have been identified in the area.	No anticipated impacts. No potential cultural resources have been identified in the area. An archaeologist would be on site during power line burial/relocation and road construction activities.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Land Use	No significant impact. The UTTR-North is designated for military testing, training, and ordnance disposal purposes. Coordination with ongoing operations conducted adjacent to the site would be necessary.	No significant impact. The UTTR-North is designated for military testing, training, and ordnance disposal purposes. Coordination with ongoing operations conducted adjacent to the site would be necessary.	No significant impact. The UTTR-North is designated for military testing, training, and ordnance disposal purposes. Coordination with ongoing operations conducted adjacent to the site would be necessary.	No significant impact. The UTTR-North is designated for military testing, training, and ordnance disposal purposes. Coordination with ongoing operations conducted adjacent to the site would be necessary.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.

Table ES-1. (continued)

Environmental Issues	CBU Valley Proposed Action	Doyle's Gulch Alternative Action	M-60 Range Alternative Action	Round Mountain Alternative Action	No-Action Alternative
Noise	No significant impact. The existing TTU noise abatement plan would be followed to ensure no adverse impacts to off-site receptors in populated areas.	No significant impact. The existing TTU noise abatement plan would be followed to ensure no adverse impacts to off-site receptors in populated areas.	No significant impact. The existing TTU noise abatement plan would be followed to ensure no adverse impacts to off-site receptors in populated areas.	No significant impact. The existing TTU noise abatement plan would be followed to ensure no adverse impacts to off-site receptors in populated areas.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Health and Safety	No anticipated impacts. Existing TTU operating and safety procedures would be followed for all OB/OD activities. Health risks associated with OB/OD emissions would not exceed acceptable levels.	No anticipated impacts. Existing TTU operating and safety procedures would be followed for all OB/OD activities. Health risks associated with OB/OD emissions would not exceed acceptable levels.	No anticipated impacts. Existing TTU operating and safety procedures would be followed for all OB/OD activities. Health risks associated with OB/OD emissions would not exceed acceptable levels.	No anticipated impacts. Existing TTU operating and safety procedures would be followed for all OB/OD activities. Health risks associated with OB/OD emissions would not exceed acceptable levels.	Increased safety risks due to prolonged storage of munitions prior to demilitarization.
Transportation	No significant adverse impacts. Road closures would occur at UTTR-North, but only during OB/OD activities.	No significant adverse impacts. Road closures would occur at UTTR-North, but only during OB/OD activities.	No significant adverse impacts. Road closures would occur at UTTR-North, but only during OB/OD activities.	No significant adverse impacts. Road closures would occur at UTTR-North, but only during OB/OD activities. Lambert Boulevard would be upgraded under this alternative.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Socioeconomic Conditions	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.
Environmental Justice	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.

Notes:

MTA = Motor Treatment Area

UTTR-North = Utah Test and Training Range – North

TTU = Thermal Treatment Unit

OB/OD = Open Burn/Open Detonation

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

Utah Test and Training Range - North (UTTR-North) is located in northwestern Utah within the Great Salt Lake Desert. It is approximately 70 miles west of Salt Lake City (Figure 1-1) and covers approximately 435,000 acres. UTTR-North is operated by Hill Air Force Base (AFB) for the United States Air Force (AF) and for the Department of Defense (DoD). The remote location of the site makes it ideal for a bombing and gunnery range. It has been used for flight training and weapons test missions for over 50 years.

A thermal treatment unit (TTU) at UTTR-North is used for treating energetic wastes, such as munitions and large rocket motors that the DoD has demilitarized (removed from service). The TTU currently treats over 500 types of explosive compounds and munitions each year. Wastes treated at the TTU are either generated locally at Hill AFB or received from other DoD installations. The thermal treatment process consists of treatment by either open burning (OB) or open detonation (OD). Up to 42,000 pounds net explosive weight (NEW) of propellant can be treated per OD event at the TTU. Normally, up to 100,000 pounds NEW of propellant are treated per OB event. The OB/OD process is described in Section 2.

Hill AFB proposes to construct and operate a second treatment unit identified as the motor treatment area (MTA) at UTTR-North because the TTU does not have sufficient operational flexibility to treat the anticipated increase in the DoD demilitarization workload, including the larger rocket motors scheduled for demilitarization in the future due to the upcoming Strategic Arms Reduction Treaty requirements. This Environmental Assessment (EA) evaluates the potential impacts to the environment from the proposed construction and operation of the MTA. Figure 1-2 shows the location of the existing TTU, and the alternative locations proposed for the MTA at UTTR-North.

1.2 Background

The TTU at UTTR-North has been used to treat energetic wastes for more than 30 years. The wastes treated at the TTU include various explosives and propellants. An explosive is assigned a hazardous classification of 1.1, 1.2, 1.3, or 1.4, depending on its characteristics. An explosive that detonates on ignition is designated as a Class 1.1 propellant; Class 1.2 explosives detonate with fragmentation. An explosive that burns rather than detonates when ignited is designated as either a Class 1.3 propellant for a rapid, high intensity burn or a Class 1.4 explosive for a more moderate burn. Appendix A contains a summary of the major types of explosives and lists specific explosives for each type.

Rocket motors to be treated at the TTU arrive at UTTR-North disassembled from any warhead and in individual stages. Each motor stage consists of a metal or composite casing, which is filled with propellant. The size of each stage is designated by the amount of propellant in the casing. Depending on the propellant type, treatment of the individual motor stages is accomplished by intentionally igniting and either burning (OB) or detonating (OD) the propellant within the missile casing. Nuclear warheads are removed from all rocket motors at off-site facilities prior to their shipment to UTTR-North. No nuclear warheads are treated at UTTR-North.

The TTU is currently the only DoD treatment site in the United States that can treat rocket motors containing greater than 10,000 pounds NEW of Class 1.1 propellant. It is permitted to treat up to 42,000 pounds NEW Class 1.1 propellant per OD event. The Air Force treated the Navy's Poseidon (C-3) second stage rocket motors at the TTU by OD between 1994 and 1999. These motors contained

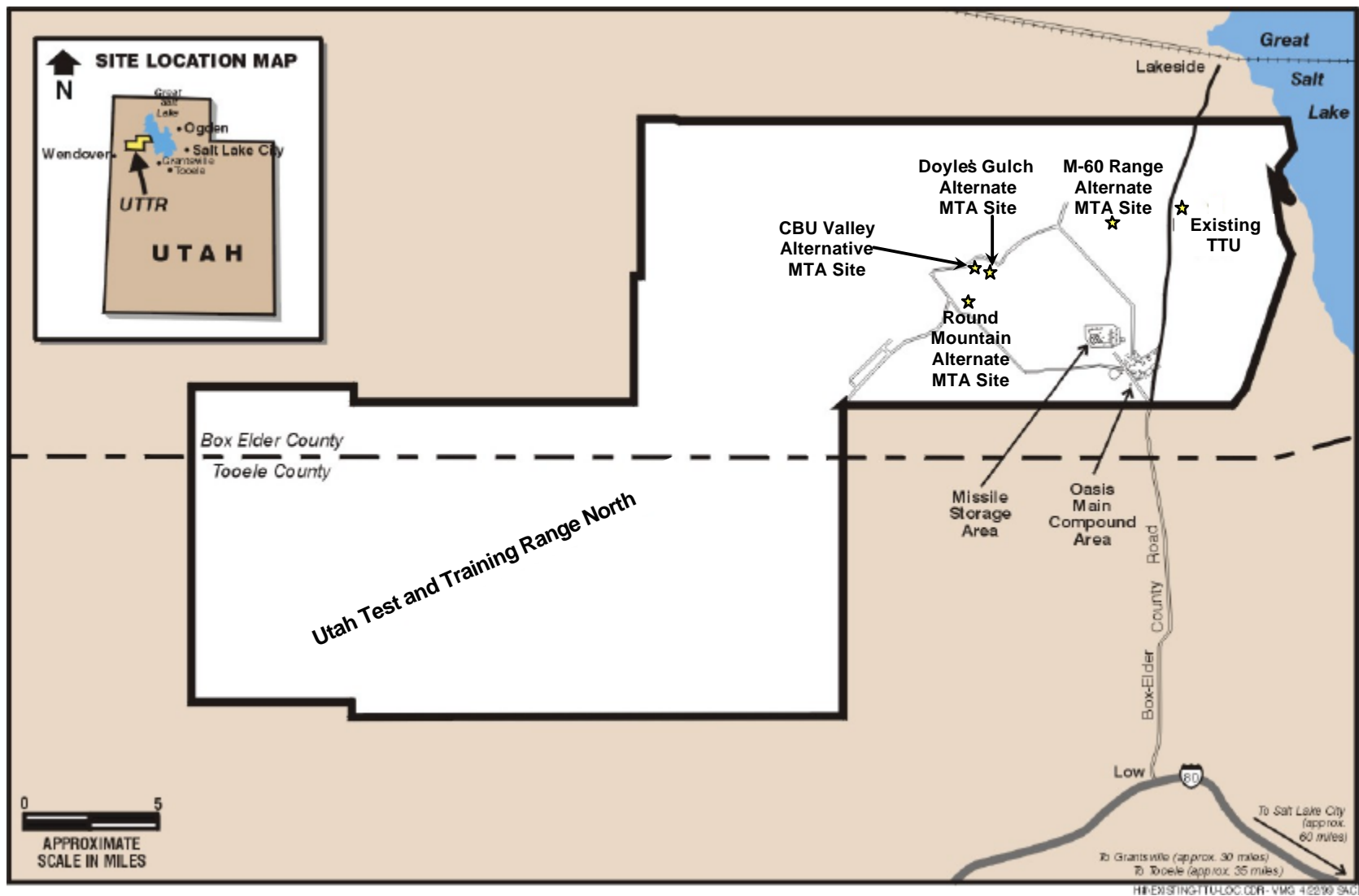


Figure 1-1. Utah Test and Training Range - North



Figure 1-2. Location of Proposed and Alternative MTA Sites

15,860 pounds NEW each of Class 1.1 propellant and typically, two Poseidon second stage motors were treated at a time. The Poseidon workload is now complete and Hill AFB is currently treating the Navy's Trident I (C-4) first and second stage motors at the TTU. Each Trident I first stage motor contains approximately 39,000 pounds NEW, so only one first stage motor is treated at a time. Each Trident I second stage motor contains approximately 17,500 pounds NEW so up to two of these motors are treated at a time. Normally, various motors with up to 100,000 pounds NEW of Class 1.3 propellant are treated at the TTU per OB event. The largest motor the Air Force has treated by OB at the TTU has been the Titan IV, which contains approximately 320,000 pounds NEW of Class 1.3 propellant.

The operations at the TTU are regulated by both an Air Quality Approval Order (AO) issued by the Utah Division of Air Quality (DAQ), and by the interim status requirements of the Resource Conservation and Recovery Act (RCRA). The Air Quality AO limits the pounds of Class 1.1 propellant that can be treated at the TTU to 42,000 pounds NEW per OD event, or 6,552,000 pounds NEW per calendar year. There are currently no limits on the pounds NEW of Class 1.3 propellant that can be treated by OB per event or per year. Hill AFB submitted a RCRA Part B permit application for the TTU to the Utah Division of Solid and Hazardous Waste (DSHW) in August 1997. Based on that application, it is anticipated that the DSHW will issue a RCRA Part B permit for the TTU that will limit the total NEW of all propellant, both Class 1.1 and Class 1.3, that can be treated at the TTU per treatment event.

Other operational constraints for the TTU are based on meteorological conditions at the time of a scheduled event. Conditions that could cause an OB/OD event to be canceled include a clearing index less than 500, high wind speed, and the presence of atmospheric inversions. The clearing index is a measure of the dispersion characteristics of the atmosphere and is used to determine whether or not missile treatment will take place.

1.3 Need for the Proposed Action

Demilitarization is the process in which the military characteristics of an item are removed, and the item is rendered unusable for its intended military purpose. Demilitarization becomes necessary when an item is no longer serviceable or logistically supportable. Service/shelf-life expiration dates are established for each item in the DoD military munitions inventory. As munitions reach their expected shelf-life, they may become unstable. When a class or manufactured lot of ordnance reaches its expiration date, a decision is made to either refurbish it, maintain it in the inventory, or withdraw it from service for demilitarization.

Due to the Strategic Arms Reduction Treaties (START and START II), as well as the overall arms reduction goals of the military, the DoD demilitarization workload is increasing. Construction and maintenance of new storage magazines to accommodate the large missile motors being removed from service would be extremely expensive, but more importantly, it is safer to treat these motors rather than store them and risk the possibility of accidental ignition (e.g., by fire, handling, or lightning strike).

Consistent with international treaties and the DoD demilitarization program, the Navy began eliminating the Trident I (C-4) missiles in 1999. This elimination is scheduled to be complete by 2015. Figure 1-3 shows a schematic of the Trident I missile, which consists of three separate stages. The Navy has requested that Hill AFB treat the first and second stages of these missiles at UTTR-North. The first stage rocket motor has a NEW of 38,938 pounds of Class 1.1 propellant. The second stage motor has a NEW of 17,460 pounds of Class 1.1 propellant. Table 1-1 lists the propellant ingredients of both stages, as well as the Poseidon second stage rocket motor propellant ingredients. Poseidon data is presented for comparison to previous TTU operations. The third stage of the Trident I rocket motor contains approximately 3,000 pounds NEW of Class 1.1 propellant and because of its smaller size, it can be treated at the Sierra Army Depot in California.

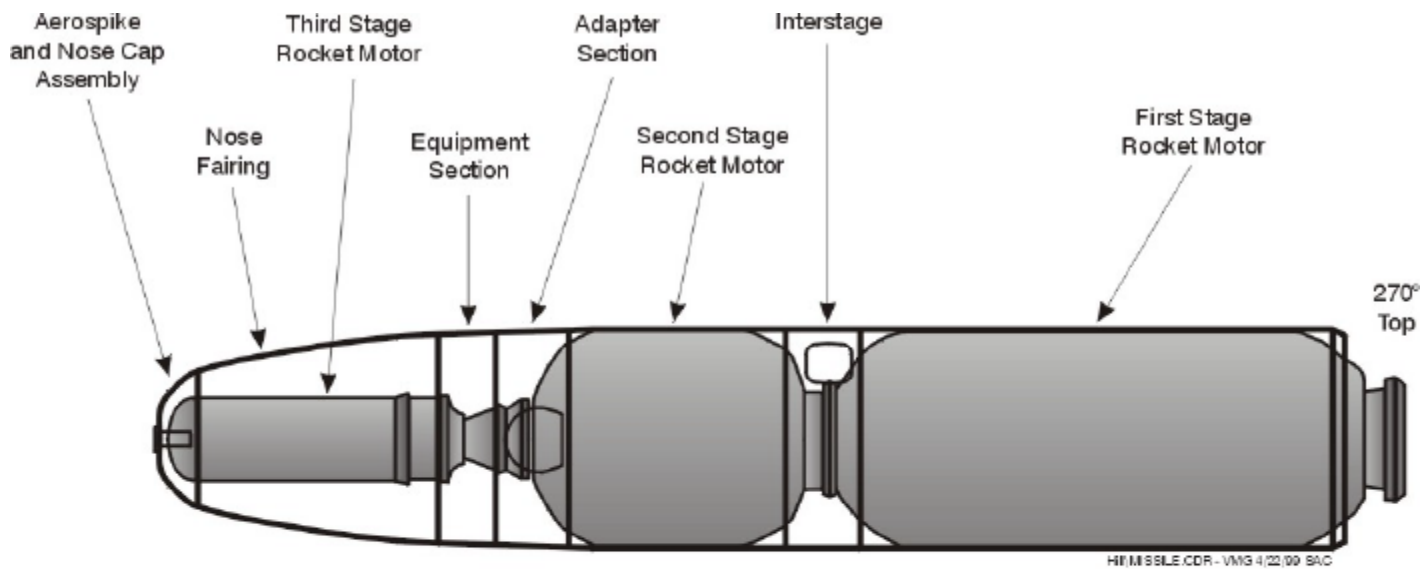


Figure 1-3. Trident I (C-4) Missile Stages

Table 1-1. Rocket Motor Comparison by Stage (Class 1.1)

Rocket Motor Stage	Poseidon (C-3) Second Stage	Trident I (C-4) Second Stage	Trident I (C-4) First Stage
Propellant Weight (NEW) [lbs]	15,860	17,460	38,938
TNT Equivalent [lbs]	15,860	22,160	49,000
Propellant Constituents			
HMX	X	X	X
Aluminum Powder	X	X	X
Ammonium Perchlorate	X	X	X
Nitrocellulose	X	X	X
Polydiethylene Adipate		X	X
Triacetin	X		
Nitroglycerin	X	X	X
2-NDPA	X	X	X
MNA		X	X
Resorcinol	X		
HDI (curing agent)		X	X
Desmodur N-100		X	X

Notes: Propellant ingredient concentrations are considered proprietary information.

Source: Naval Surface Warfare Center

Because of existing environmental regulatory limitations and operational constraints, the TTU does not have sufficient operational flexibility and capacity to handle the anticipated increase in the DoD demilitarization workload. Therefore, another treatment option must be made available. In addition to treating the Navy's Trident I first and second stage rocket motors, other Class 1.1 missile propellants with similar composition, such as the Navy's Trident II (D-5) rocket motors, may eventually be treated at the new treatment unit. Each Trident II first stage motor contains approximately 80,000 pounds NEW of Class 1.1 propellant. The Trident II second and third stage motors contain approximately 23,000 pounds and 6,000 pounds NEW of Class 1.1 propellant, respectively. The new treatment unit would also treat similar waste streams (including Class 1.3 propellant motors) as those currently treated at the TTU.

Two decisions to be made in selecting the preferred treatment alternatives are: 1) the method of treatment to be used (OB/OD, propellant washout, etc.); and 2) the treatment site location. The selection criteria for these decisions and the description of the alternative actions at UTTR-North are presented in Section 2.

1.4 Applicable Requirements

There are several regulatory environmental programs that apply to the proposed action. These program requirements are described below.

1.4.1 National Environmental Policy Act Requirements for Air Force Actions

The National Environmental Policy Act (NEPA) of 1969 requires federal agencies to analyze the potential environmental impacts of a proposed action and to evaluate reasonable alternative actions. The results of the analyses are used to make decisions or recommendations on whether and how to proceed with

those actions. Air Force Instruction (AFI) 32-7061 describes the process of preparing an EA for proposed actions on Air Force property. Based on the EA, either a Finding of No Significant Impact (FONSI) or an Environmental Impact Statement (EIS) is prepared. Both the AFI 32-7061 guidance and the implementing regulations of NEPA (40 *Code of Federal Regulations* [CFR] 1500) were followed in preparing this EA.

1.4.2 Air Quality Requirements

The Utah Air Quality Regulations, found in the *Utah Administrative Code* (UAC) R307, apply to the proposed construction and operation of the new treatment area. A Notice of Intent (NOI) for an Air Quality AO is being prepared in conjunction with this EA (Radian, 1998b). The NOI will be submitted to the DAQ prior to commencing OB/OD operations at the MTA. The proposed action would occur in an area that is in attainment status with all of the National Ambient Air Quality Standards. Therefore, the federal conformity requirements of 40 CFR 93.153 do not apply, and a conformity determination is not required.

1.4.3 RCRA Requirements

The RCRA Part B permitting requirements will apply to this proposed action. A modification to the permit application submitted for the TTU will be prepared after the final MTA location is selected, and will be submitted to the DSHW prior to commencing the proposed MTA construction or operations.

1.4.4 Transportation Requirements

The United States Department of Transportation (DOT) requirements of 49 CFR Part 173, Subpart C, regulate the transportation of explosives over public transportation systems. No person may transport a Class 1 explosive, as defined in 49 CFR 173.50, unless it has been tested, classed, and approved by the Associate Administrator for Hazardous Material Safety.

1.4.5 Noise Emission Requirements

Environmental noise emissions are regulated by the *Noise Control Act of 1972* (NCA). The NCA requires federal facilities to implement measures to reduce noise emissions. Generally, federal agencies whose activities result in increased environmental noise in the surrounding community are responsible for compliance with state and local environmental noise requirements. The State of Utah has no noise control regulations, although Utah Code 10-8-16 gives cities the authority to develop noise control regulations or standards. Hill AFB developed a Sound Focus Mitigation Plan in 1995 for OD operations at the TTU. The plan was updated in 1999 and is included in the Air Quality AO for the TTU. It is anticipated that a similar plan will be developed for OD operations at the MTA.

1.4.6 Natural Resource Requirements

The *Endangered Species Act of 1973* provides for the designation and protection of invertebrates, wildlife, fish, and plant species that are in danger of becoming extinct and conserves the ecosystems on which the species depend. Endangered species are animals or plants listed by regulation as being in danger of extinction. Threatened species are animals or plants that are likely to become endangered within the foreseeable future. Candidate species are animals or plants that have been selected for evaluation for inclusion on the threatened and endangered species list. Candidate species may be considered for immediate listing if significant parts of their habitat are threatened by human impact.

Raptors (birds of prey) are protected wildlife and are widely accepted indicator species of environmental quality due in part to their position at the top of biological food chains (United States Fish and Wildlife Service [USFW], 1999). Raptors as a group are considered migratory birds and are protected under the *Migratory Bird Treaty Act* (MBTA), 16 U.S.C 703-6712. Specific protection for bald and golden eagles is authorized under the *Eagle Protection Act*, 16 U.S.C. 668. These acts place restrictions on the “taking” of eagles’ nests. Federal agencies are exempt from the need to obtain a “take” permit under

the MBTA or the Eagle Act (USFW, 1999); however, the intent of the laws are still applicable and should be employed on all federal projects.

1.4.7 Cultural Resource Requirements

Section 106 of the *National Historic Preservation Act of 1966*, as amended, requires federal agencies to evaluate sites containing cultural resources that may be affected by their activities. If a site is determined eligible for listing on the National Register of Historic Places (National Register), it must be protected, if possible, from actions that could adversely affect its significant qualities. Otherwise, provisions for site mitigation, which may involve site documentation or data recovery, must be implemented. Cultural and historic resources are also protected by the *Antiquities Act of 1906*, the *Historic Sites Act of 1935*, the *Archaeological Resources Preservation Act of 1979*, and the *Native American Graves Protection and Repatriation Act of 1990*.

1.5 Scope and Organization of This Document

The remainder of this document is organized as follows:

- Section 2 provides a description of the alternative actions being proposed, including the no-action alternative;
- Section 3 describes the existing environmental conditions at UTTR-North;
- Section 4 identifies the potential environmental consequences associated with implementation of each of the proposed alternatives;
- Section 5 presents a list of the preparers of this report;
- Section 6 contains a list of offices, agencies, and persons contacted for information used in the report;
- Section 7 includes a list of references;
- Appendix A contains a summary of the major types of explosives and lists specific explosives for each type;
- Appendix B contains a detailed discussion of various treatment technologies associated with the treatment of energetic wastes;
- Appendix C contains site photographs of the alternative MTA locations;
- Appendix D contains an evaluation of the effect of ground vibrations from the proposed MTA at UTTR-North; and
- Appendix E describes the Air Impact Modeling methodology that was used in determining potential air quality impacts for this EA.

2.0 DESCRIPTION OF PROPOSED ACTION ALTERNATIVES

This section describes the proposed action to treat and dispose of energetic wastes at UTTR-North and the alternatives evaluated. Several different treatment technologies were considered in the development of the alternatives, as well as various possible treatment site locations. The selection criteria for both the treatment method and the site location are presented, and the alternative actions are described.

2.1 Wastes to be Treated

The proposed action at UTTR-North consists of treating various energetic wastes, such as missile motors and other propellants, explosives, and pyrotechnics. The energetic wastes include physically-intact unserviceable munitions, scrap propellant, and/or off-specification ordnance and propellant. These wastes meet the definition of a hazardous waste found in 40 CFR 261.23(a), due to their reactivity characteristics. Specifically:

- They are capable of detonation or explosive reaction if they are subjected to a strong initiating source or if heated under confinement; and
- They are Class 1 explosives, as defined in 49 CFR Part 173.

The new treatment system must have the capability to treat the Trident I first and second stage rocket motors, as well as other Class 1.1 propellants with similar composition. The new treatment system would also need to be capable of treating some of the Class 1.3 wastes presently treated at the TTU and other similar waste streams. A summary of the types of explosive wastes treated at the TTU is included in Appendix A. Nuclear warheads would not be treated at UTTR-North.

2.2 Treatment Technologies

Two basic approaches for treating missile motors include: 1) burning or detonating the missile propellant while it is still in the motor casing, and 2) removing the propellant from the motor casing and subsequently treating the propellant. This section describes the various treatment processes available or currently being developed, and the status of those technologies, as reported in the Naval Surface Warfare Center (NSWC) *1998 Technology Update Summary*. A more detailed discussion of these technologies is included in Appendix B.

2.2.1 Propellant Burning/Detonation While in Motor Casing

The following treatment processes consist of destroying a missile motor, propellant, and casing by purposefully inducing a controlled OB, OD, or static-fire event. Depending upon the type of propellant, the motor will either burn or detonate.

OB/OD Thermal Treatment Process

The OB/OD process takes place in an outdoor open area. The missile motors are placed on sand bags on the ground, which has been leveled and cleared of large aggregate. OB treatment of large missile motors is accomplished by splitting open the missile casings with high explosive-filled, shaped charges, igniting the missile propellant inside. OD treatment is accomplished by detonating blocks of high explosives in the missile motor, causing the entire motor to detonate. The OB/OD treatment process requires a minimum amount of motor handling and treatment equipment, resulting in a safe and simple operation when conducted in proper remote locations. The OB/OD treatment process is currently being employed at the TTU.

Static Firing

The static firing treatment method consists of igniting the rocket motor restrained by a mechanical device. This method is often used to measure the amount of thrust generated by the motor. Because of the age of the motors to be treated, cracks or separations of the propellant may occur. This defect could result in a malfunction/detonation on the test stand upon ignition. A radiograph of each motor is necessary prior to treatment.

Contained Burn with Scrubber

This technology consists of static firing in a combustion chamber under controlled environmental conditions. A nozzleless rocket motor is placed in a combustion chamber where the propellant is ignited and burns to completion under ambient pressures. The combustion products are captured and treated with a chemically buffered water bath and standard industrial gas treatment equipment prior to release to the environment. This technology has not been fully developed and is not presently undergoing further development efforts.

2.2.2 Propellant Removal Technologies

The three technologies described below may be used to remove propellant from the missile motor casing. These processes must be combined with treatment or disposal of the removed propellant as discussed in Section 2.2.3. If it is economically feasible, some components of the propellant may be reclaimed for alternative use in explosive and other industrial processes.

High-Pressure Waterjet Washout

This process consists of a high-pressure washout system composed of a waterjet lance, coupled with an automated control system. The control system monitors and controls lance maneuvers and operations. The waterjet lance is used to cut the solid rocket motor propellant and remove it from the rocket motor casing. A pilot-scale prototype of this removal technology has been tested for Class 1.1 propellants, but only on small rocket motor stages (approximately 4,000 pounds NEW). This technology is still in the process of being developed and is not production ready at this time.

Cryogenic Washout

Cryogenic washout consists of directing streams of high-pressure cryogenic fluid, such as liquid nitrogen, against the propellant inside a rocket motor. The combination of cold temperature and fluid shear causes the propellant to be eroded away from the motor casing and recovered as dry powder. The dry powder is then either reclaimed or destroyed. During prototype testing of this technology, certain technical issues with pump pressure and performance were identified (see Appendix B). Nozzle design must be further developed, and problems with electrostatic discharge must be resolved, prior to transitioning to production.

Machining

This process removes propellant from the motor casing by mechanical grinding or cutting. Propellant removed via this process would need to be destroyed or reclaimed. As discussed in Appendix B, the production-level capability of this technology for Class 1.1 propellant-filled motors is currently limited to smaller size rocket motors. Large motors would need to be sectioned to utilize this technology at this time, increasing motor handling time and associated safety risk.

2.2.3 Propellant Treatment and Disposal Technologies

Once the rocket propellant has been removed from the motor casing, it must be reclaimed or destroyed. The following four propellant disposal technologies can be used in conjunction with the removal methods described above.

Mineral Acid Reclamation

This system is being developed in conjunction with the waterjet washout technology. Propellant is first solubilized in concentrated mineral acid, separating soluble energetic materials and oxidizers from insoluble binder materials. Energetic materials are then removed from solution and recrystallized for reuse, while spent mineral acid is recycled. This reclamation procedure has been successfully demonstrated at the pilot scale but is not yet production-ready.

Near Critical and Super Critical Water Oxidation

Decomposition of propellant ingredients occurs around 374 °C and 218 atmospheres (known as the critical point of water). Complex organic molecules break down into short-chain, low-molecular weight compounds, which are capable of mixing with the near critical or super critical water. Gasses such as oxygen, nitrogen, and carbon dioxide become completely dissolved, and the solution acquires gas-like density and viscosity. Under these conditions, rapid oxidation of propellant ingredients occurs in a short amount of time, resulting in effluents of carbon dioxide, water, nitrogen, and salts. This technology has not yet been conducted on a full-scale operation.

Aqueous Waste Stream Biodegradation

This method uses naturally occurring bacteria to dispose of propellant that has been removed from missile motor casings. A strain of microorganisms in an aqueous state is used to reduce energetic materials under anaerobic conditions. Due to the inherent toxicity of most propellant ingredients, this technology has been shown to be most effective at low concentrations.

Critical Fluid Demilitarization and Reclamation

Critical fluid demilitarization consists of four steps: 1) the motor propellant is removed by hydraulic erosion using liquefied ammonia; 2) the oxidizer and energetic materials are extracted from the propellant granules, leaving behind the insoluble binder residue; 3) the oxidizer and/or energetic material is recovered by evaporating the liquefied ammonia; and 4) ammonia is condensed and recycled for continuation of the extraction process. The desensitized propellant (rubber binder and aluminum) is burned at 3000 °F in cement rotary kilns. This technology is currently in transition to a production-ready state for smaller size rocket motors containing Class 1.1 propellant. Extensive redesign and testing would be required to accommodate large rocket motors such as the Poseidon or Trident I rocket motors in a full-scale production facility.

2.3 Formulation of Alternatives

The selection of the acceptable alternative actions is a two-step process. First, the method of treatment must be selected. Next, an appropriate treatment location must be identified. This section describes the selection criteria used to eliminate some alternatives from further consideration and to develop reasonable treatment alternatives for further evaluation in this EA.

2.3.1 Treatment Method Selection Criteria

The technology selection criteria listed below were used to identify an appropriate treatment method for energetic wastes at UTTR-North. To be considered a reasonable alternative, the treatment method must:

- Not interfere with the mission of Hill AFB, nor adversely affect DoD facilities or operations;
- Be a proven and reliable technology;
- Be protective of human health and the environment;

- Present minimal safety risks, including the least amount of motor handling;
- Be available and production ready; and
- Be capable of treating rocket motors efficiently, due to stockpile limitations and stability concerns as shelf life is approached.

The treatment method selected for use at UTTR-North is OB/OD. It is a proven and reliable cost-effective technology that meets all the selection criteria. All the other treatment technologies are in various stages of development and either are not production-ready or have not been proven on a large scale (NDIA Symposium, 1998). Additionally, OB/OD requires the least amount of missile motor and propellant handling, resulting in reduced health and safety risks to personnel.

2.3.2 Site Selection Criteria

The proposed treatment unit has been designated as the Motor Treatment Area (MTA). Based on implementing the OB/OD treatment technology at the MTA, the Air Force has established the following site selection criteria:

- The site selected shall not interfere with the mission of Hill AFB nor adversely affect DoD facilities or operations.
- In accordance with the USFW Utah Field Office Guidelines (USFW, 1999), human disturbance should not occur within 0.5 miles of an active golden eagles' nest. However, due to the magnitude of the proposed action, both the USFW and the Utah Division of Wildlife Resources (DWR) have recommended that if the disturbance is located less than two miles from an active golden eagles' nest and in direct line-of-sight, then a study should be conducted to determine potential impacts to eagle courtship/nesting activities.
- Any disruption to nearby archaeological or cultural resource sites should be minimized or mitigated.
- A two-mile radius safety buffer is required around the site within the facility boundaries.
- Areas where there is a high probability of existing unexploded ordnance (UXO) increase safety risks associated with pad development and OB/OD operations. This could make the site less desirable, and possibly unacceptable, depending on the extent of UXO in the area.
- The site cannot be placed where the soil type is such that liquefaction could occur, such as within the mudflat areas (soil classification Playas and Saltair).
- The topography must provide adequate drainage to minimize wet, muddy conditions that would inhibit use of large machinery required to off load and handle motors.
- In accordance with START requirements, the site must be directly visible from an observation point.

The above criteria would cause the elimination of sites because of operational concerns, safety concerns, or project feasibility. Sites that were eliminated from further consideration are discussed in Section 2.3.3. Sites that meet the selection criteria are discussed in detail in Section 2.4.

2.3.3 Sites Eliminated From Further Consideration

Seven locations at UTTR-North were initially identified as possible alternatives for the site of the MTA. All the sites were located at least two miles from UTTR-North boundaries and off the mudflats. Upon further evaluation, three of these seven sites were eliminated for the following reasons:

- Candy Mountain Area — This site is located approximately 0.6 miles south of the southern point of Candy Mountain, centered within a semicircular ridge of mountains immediately south of this site. This site has been eliminated as a possible MTA location due to the presence of an active golden eagles' nest located less than 0.5 miles away from the site and in direct line-of-sight.
- Target 22 — This site is located immediately southwest of the runway at Target 22. This site has been eliminated as a possible MTA location due to poor drainage conditions. During wet times of the year, muddy conditions may inhibit motor offloading activities. In addition, an active golden eagles' nest is located approximately one mile away from the site.
- Central CBU Valley — This site is located approximately 2 miles southwest of Candy Mountain. This site has been eliminated as a possible MTA location due to the presence of potentially significant amounts of UXO throughout the area, which would create an unacceptable safety hazard.

2.4 Description of Alternatives

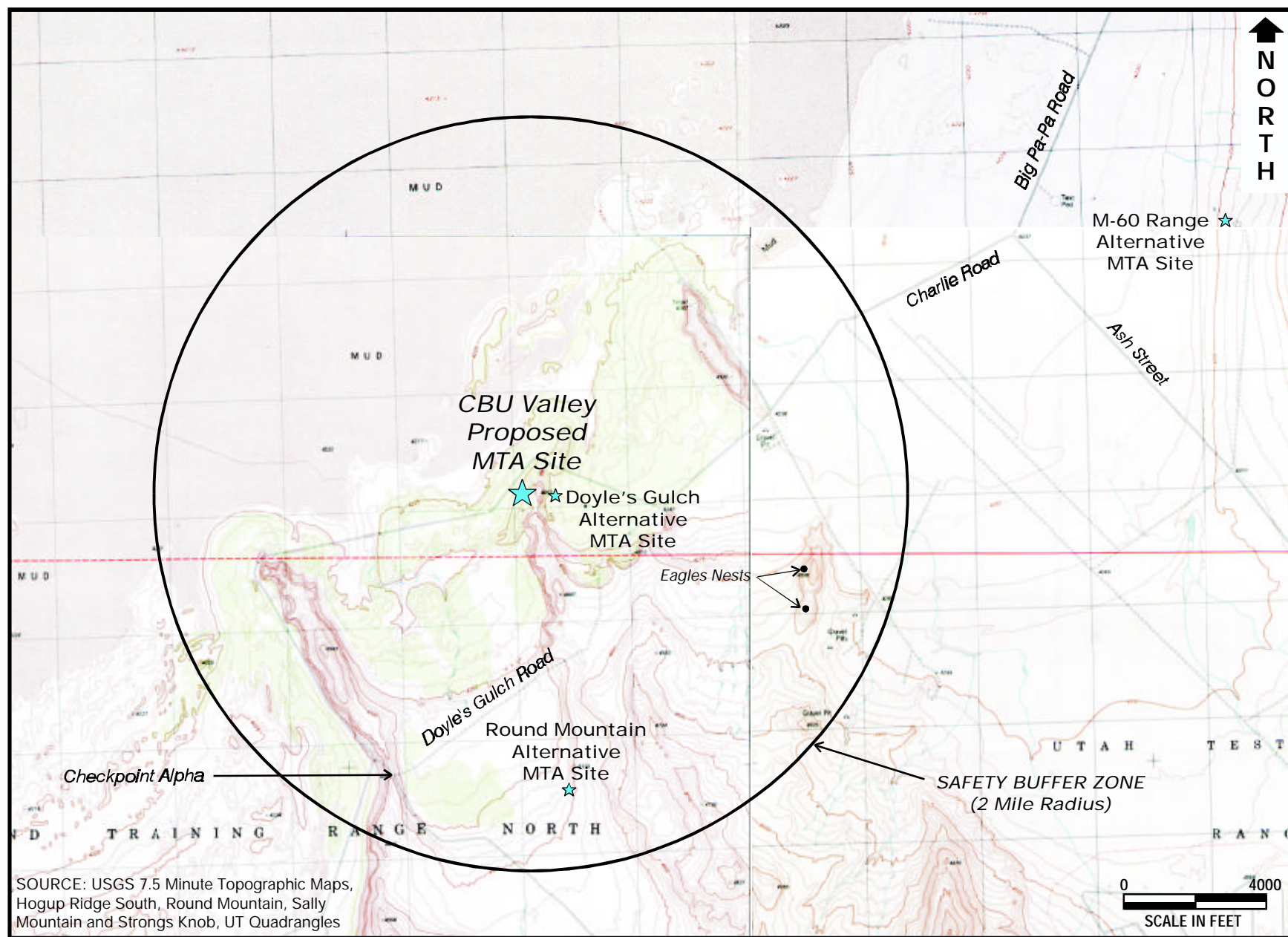
This section describes the proposed action for treating the increasing workload of DoD energetic wastes at four alternative locations on UTTR-North that met the MTA site selection criteria. Because OB/OD is the only technology that meets the treatment method selection criteria presented in Section 2.3.1, the proposed action consists of thermal treatment of waste munitions by OB/OD. Under the proposed action, treatment pads would be constructed by leveling and clearing the ground of vegetation and large aggregate. Up to 80,000 pounds Class 1.1 propellant or up to 100,000 pounds Class 1.3 propellant may be treated per treatment event. Up to four OB/OD events could occur each week.

Test detonations may be conducted at any of the alternative MTA locations as part of the proposed action. The tests would consist of the detonation of one to four Trident I second stage rocket motors or one to two Trident I first stage rocket motors. The test detonations may take place before or after final MTA site selection. The results of the tests would be used to support Air Quality and RCRA permitting requirements.

Based on the site selection criteria presented in Section 2.3.2, four sites were determined to be reasonable treatment location alternatives for the MTA. These sites are the CBU Valley site, the Doyle's Gulch site, the M-60 Range site, and the Round Mountain site (see Figure 1-2). Site photographs for each of the alternative locations are provided in Appendix C. Additional criteria, such as distance to gravel and water supplies, existing road access, geological features (for noise dissipation concerns and convenience of observation points), and economic considerations were evaluated to aid in determining site desirability. The alternative MTA locations are described in Sections 2.4.1 through 2.4.4 below. A description of the no-action alternative is also presented (Section 2.4.5), as required by NEPA.

2.4.1 Description of the CBU Valley Alternative Action Site

This alternative consists of treating energetic wastes by OB/OD at the CBU Valley site. The general location of this alternative action is shown in the previous section (see Figure 1-2). Figure 2-1 is a topographic map of the site. As discussed below, this site satisfies the selection criteria presented in Section 2.3.2:



HIIIMTA-CBU-TOPO1199-NEW.CDR - VMG 11/23/99 SAC

Figure 2-1. Detail of the CBU Valley Proposed Action Site

- Use of the site would not interfere with the mission of Hill AFB or the DoD. However, site operations would have to be coordinated with aerial training missions conducted in the immediate area.
- The nearest known eagles' nest is located approximately 1.3 miles away but in direct line-of-sight. There are no other wildlife concerns associated with this site.
- Two potentially significant archaeological sites have been identified within 0.25 miles of this location; however, impacts to these sites could be mitigated, if necessary, as described in Section 4.
- There are no safety concerns. The site is approximately five miles away from the nearest UTTR-North boundary and over two miles away from the missile storage area and any occupied buildings.
- The soil type (Dynal-Tooele, Saline Complex) is such that liquefaction is not expected to occur, and drainage in the area is good, with minimal low spots.
- Two adequate observation points are available along Lambert Boulevard, approximately two miles from the site.

This alternative location also includes expanding the observation points (at the tank bunker and at the bleachers along Lambert Boulevard) to accommodate additional vehicle parking during OB/OD events.

Minimal road development (less than 0.25 miles) would be required to provide access to the site. However, a new water supply well would need to be developed in the immediate area. The nearest existing well is located near Target 22, approximately 1.5 miles to the east. Additionally, if adverse impacts to nearby nesting golden eagles were observed any time during the two-year eagle study, the USFW or the DWR could require that the MTA be relocated from this site or that mitigation efforts be employed.

2.4.2 Description of the Doyle's Gulch Alternative Action Site

This alternative consists of treating energetic wastes by OB/OD at Doyle's Gulch, located approximately 0.25 miles east of the CBU Valley site. The general location of this alternative is shown in the previous section (see Figure 1-2). Figure 2-2 is a topographic map of the site. As discussed below, this site satisfies the selection criteria presented in Section 2.3.2:

- Use of the site would not interfere with the mission of Hill AFB or the DoD. However, site operations would have to be coordinated with aerial training missions conducted in the immediate area.
- The nearest known eagles' nest is located approximately 1.3 miles away from the proposed treatment pad location. There are no other wildlife concerns associated with this site.
- A potentially significant archaeological site has been identified within 0.5 miles of this location; however, impacts to this site could be mitigated, if necessary, as described in Section 4.

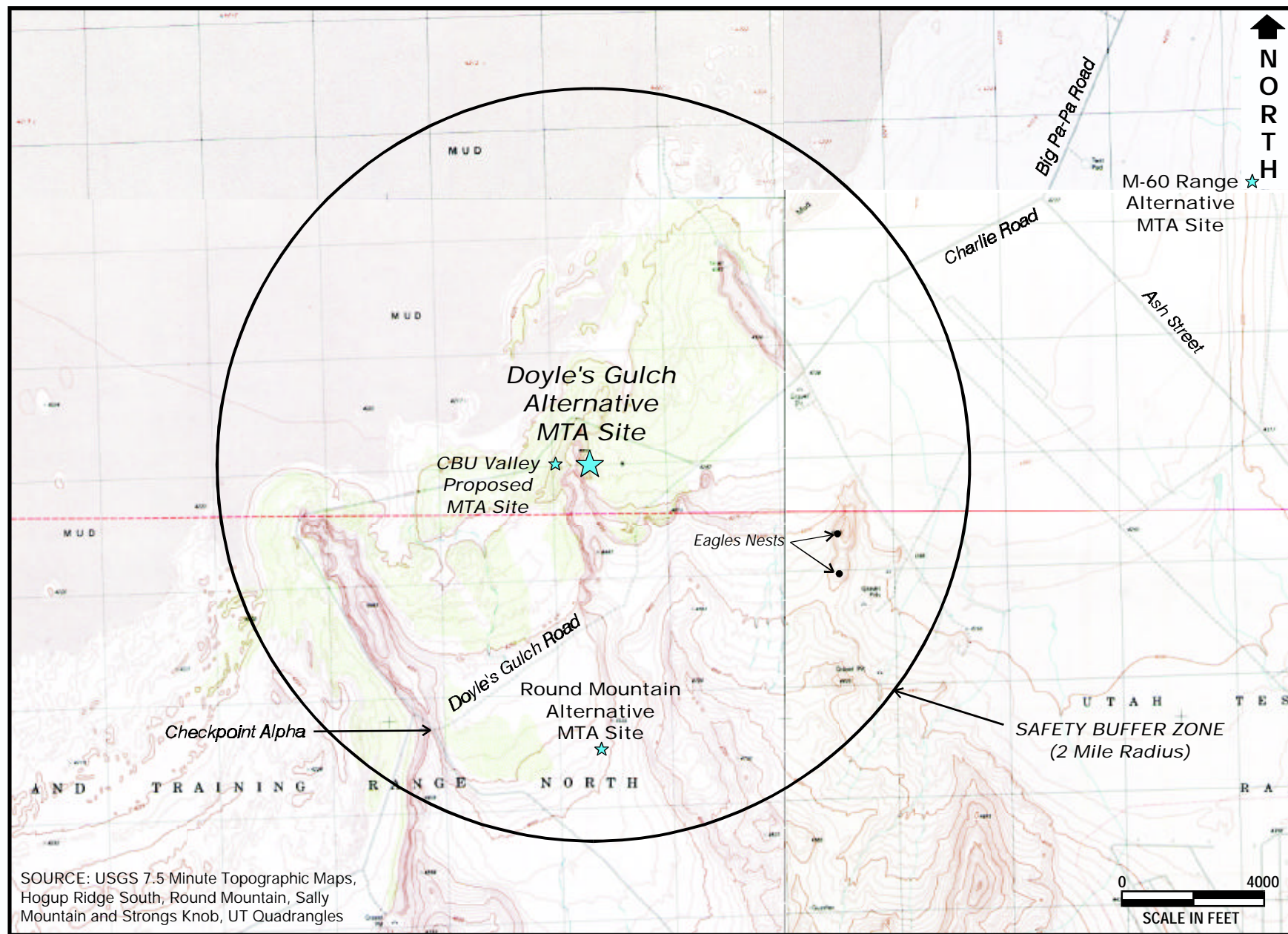


Figure 2-2. Detail of the Doyle's Gulch Alternative Action Site

- There are no safety concerns. The site is approximately five miles away from the nearest UTTR-North boundary and over two miles away from the missile storage area and any occupied buildings.
- The soil type (Dynal-Tooele, Saline Complex) is such that liquefaction is not expected to occur, and drainage in the area is good, with minimal low spots.
- Adequate observation locations are available, including a site known as Pad #4.

Factors contributing to site desirability include: 1) a gravel pit is located within 500 yards of the site, minimizing ground disturbance associated with gravel hauling; and 2) minimal road development (less than 0.5 miles) would be required to provide access to the site. However, a new water supply well would need to be developed in the immediate area. The nearest existing well is located near Target 22, approximately 1.5 miles to the east. Additionally, if adverse impacts to nearby nesting golden eagles were observed any time during the two-year eagle study, the USFW or the DWR could require that the MTA be relocated from this site or that mitigation efforts be employed.

2.4.3 Description of the M-60 Range Alternative Action Site

The M-60 Range alternative MTA site is located near the existing M-60 small arms range and the Little Pappa test site. The general location of this alternative is shown in the previous section (see Figure 1-2). Figure 2-3 is a topographic map of the site. The site meets the selection criteria presented in Section 2.3.2:

- Use of this site would not interfere with the mission of Hill AFB or the DoD. However, site operations would require coordinating with aerial training missions, because the site is located adjacent to two existing targets.
- The site is located approximately one mile from an active golden eagles' nest. Additional wildlife concerns in this area consist of the indirect impact of the detonations on a healthy prey population for surrounding eagles.
- No known archaeological sites have been identified within one mile of this location.
- There are no safety concerns. The site is approximately four miles away from the nearest UTTR-North boundary and over two miles away from the missile storage area and any occupied buildings.
- The soil type (Skumpah, Silt Loam, saline) is such that liquefaction is not expected to occur, and drainage in the area is good, with minimal low spots.
- There are several possible observations points that could be feasible with varying degree of development required.

Minimal road development would be required; however, a water supply well would need to be developed in the immediate area, and the nearest gravel pit is located near Candy Mountain, approximately two miles from the M-60 site. Also, the possibility exists that a railroad spur line will be constructed through the M-60 Range area. If this were to occur, it could cause additional scheduling conflicts. Additionally, if adverse impacts to nearby nesting golden eagles were observed any time during the two-year eagle study, the USFW or the DWR could require that the MTA be relocated from this site or that mitigation efforts be employed.

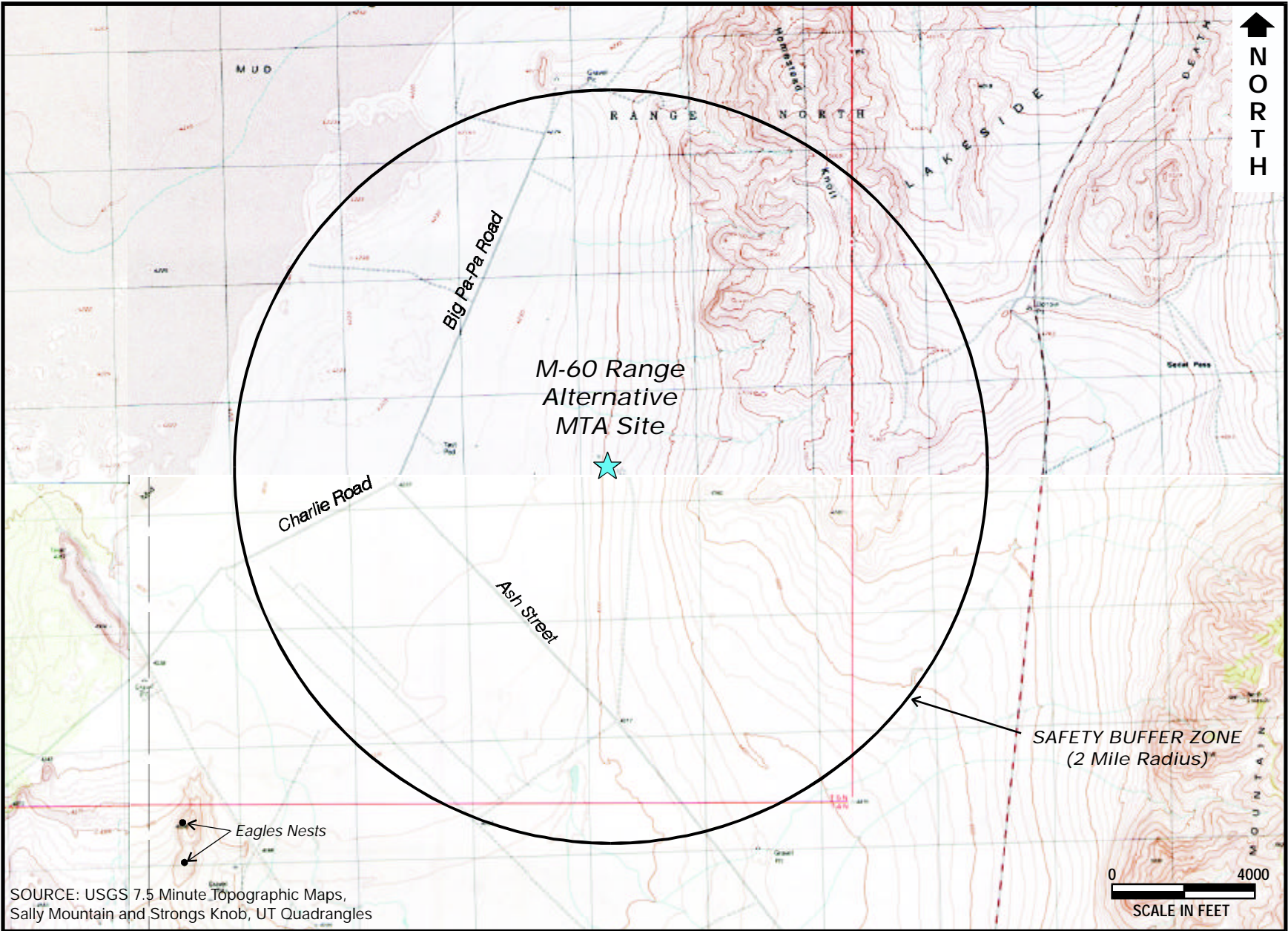


Figure 2-3. Detail of the M-60 Range Alternative Action Site

2.4.4 Description of the Round Mountain Alternative Action Site

The Round Mountain site for the MTA is located approximately two miles south-southwest of Candy Mountain. The general location of this site is shown in Figure 1-2. Figure 2-4 is a topographic map of the site. The site meets the selection criteria presented in Section 2.3.2:

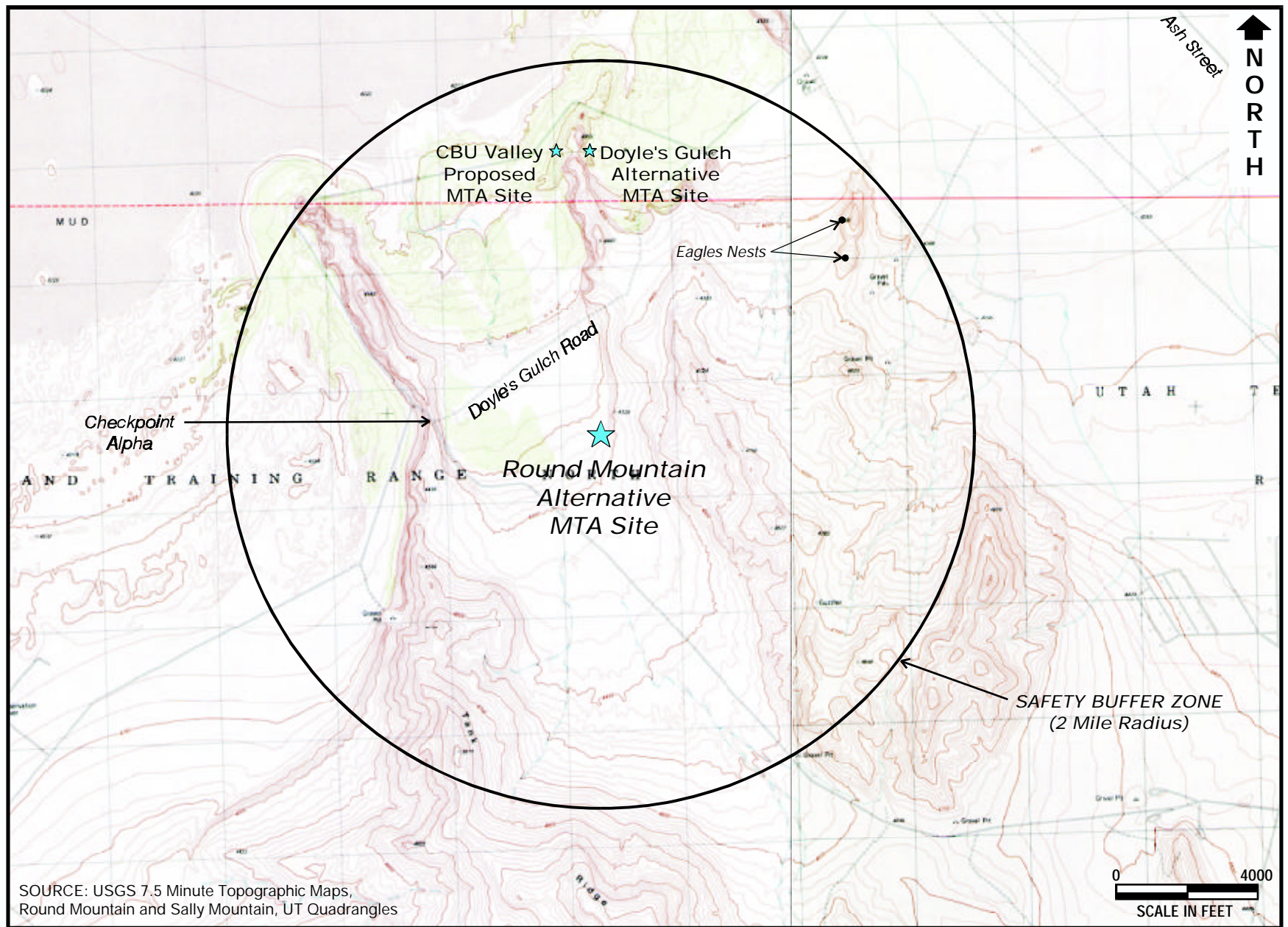
- Use of this site would not interfere with the mission of Hill AFB or the DoD. However, site operations would require coordination with aerial training missions conducted in the immediate area.
- The nearest active golden eagles' nest is located approximately 1.75 miles northeast of this site, beyond a high mountain ridge.
- A pedestrian inventory of the site was conducted in January 1999 (Dames & Moore, 1999), and no archaeological sites were identified.
- There are no safety concerns. The site is approximately 3.6 miles away from the nearest UTTR-North boundary and over two miles away from the missile storage area and any occupied buildings.
- The soil type (Skumpah-Yenrab Complex, saline) is such that liquefaction is not expected to occur, and drainage in the area is good, with minimal low spots.
- An adequate observation point is located southeast of Round Mountain, approximately 3.5 miles southeast of the site.

As part of this alternative action, significant road improvements to four miles of Lambert Boulevard would be required to ensure safe transportation of motors to the MTA pad. Also, approximately 1.8 miles of road would be constructed from what is currently a rough, partially vegetated, four-wheel drive road from Lambert Boulevard to the proposed observation point, and approximately 0.5 miles of new road would need to be developed from Lambert Boulevard to the MTA pad. Additionally, due to safety concerns, approximately 1.7 to 2.1 miles of existing power lines and fiber optic utilities located along Lambert Boulevard would need to be relocated or buried.

2.4.5 Description of the No-Action Alternative

Under the no-action alternative, additional treatment units would not be developed at UTTR-North. Other than the existing TTU, there are no facilities in the United States that can handle rocket motors containing greater than 10,000 pounds NEW of Class 1.1 propellant. The Trident I first and second stage rocket motors could be treated at the TTU, however, the TTU may not have sufficient capacity to handle the anticipated increase in the DoD demilitarization workload in a timely manner. In addition, the TTU cannot treat Class 1.1 propellant motors larger than 42,000 pounds NEW, such as the Trident II (D-5) first stage rocket motors. Therefore, munitions would continue to stockpile.

As munitions reach their expected shelf life, they may become unstable. Unanticipated events such as fire, lightning strike, or other accidents could cause additional safety concerns. Under the no-action alternative, safety risks would increase during the length of time the munitions remained in storage.



HIIMTA-ROUND-MT-TOPO1199-NEW.CDR - VMG 11/23/99 SAC

Figure 2-4. Detail of the Round Mountain Alternative Action Site

3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

The purpose of this section is to describe the current environment at UTTR-North with regard to the natural resources, air quality, economics, and physical conditions.

3.1 Surface Water

No perennial streams originate on UTTR-North, but there are a few ephemeral streams located within the Grassy Mountains. The only flows in the stream channels on UTTR-North are found just below perennial springs. Within UTTR-North boundaries, there are two springs in the Lakeside Mountains. There are also a number of springs east of the range in the Grassy Mountains and in the southern extension of the Lakeside Mountains (Enviro-Support, 1998). Any flow originating from these springs generally infiltrates within a short distance of the spring. All of the streams and most of the springs are located on mountain flanks, adjacent foothills, or nearby lowlands.

Surface water becomes progressively more limited towards the Great Salt Lake. Most of the precipitation that falls on the area is quickly discharged by evapotranspiration or is stored temporarily as soil moisture and then discharged by evapotranspiration (Dames and Moore, 1997a).

The Great Salt Lake borders on the east side of UTTR-North. It is a shallow saline remnant of Lake Bonneville that is confined in a low depression within the Great Basin. Waters that flow into the lake are trapped within the closed basin and can leave only by evaporation. All four alternative MTA locations are all at least six miles from the lake.

3.2 Groundwater

The older valley fill underlying the area of the four alternative MTA locations is the principal groundwater source in the area. Other geologic units are known to contain groundwater, but are generally considered inadequate sources for development. During the September 1998 test detonations, the uppermost unconfined aquifer was observed at the second test pad at a depth of approximately 7 to 10 feet. The depth to the uppermost unconfined aquifer at the alternative MTA locations is unknown.

The principal source of recharge to the groundwater is from precipitation on the adjoining mountains. Recharge occurs primarily above an elevation of 4,600 feet mean sea level (MSL), because most of the area below 4,600 feet MSL is underlain by fine-grained lakebed deposits of low permeability and of sufficient thickness to prevent much recharge to the older valley fill. Some underflow from adjoining valley fill and Paleozoic bedrock may also provide recharge.

Groundwater occurs in the older valley fill under both water table and artesian conditions, although most water-bearing zones appear to be unconfined within the area. A recent inclination survey was conducted on the monitoring wells located at Landfill 5, UTTR-North (CH₂MHill, 1999). The survey results indicate that groundwater flow in the area is to the north. The hydraulic gradient calculated from these wells is 0.00018 feet/foot. Groundwater was reported at depths ranging from 383 to 451 feet below ground surface (bgs).

Groundwater quality at UTTR-North is characterized by a high chloride content. Chloride concentrations increase with depth, ranging from approximately 1,500 milligrams per liter (mg/L) at 200 feet to over 20,000 mg/L at 700 feet (Price and Bolke, 1970). The concentration of dissolved solids (1,600 mg/L to greater than 48,000 mg/L) also increases with depth (CH₂MHill, 1988). Groundwater samples were collected from two wells in the vicinity of the existing TTU since 1994 and analyzed for energetics and metals. Analytical results showed seven metals (calcium, iron, magnesium, manganese, potassium, sodium, and zinc) were present in most groundwater samples taken from both wells. Each of these elements is commonly found in background area soils. Nitrobenzene was detected in one sample at a concentration of 0.25 micrograms per liter (µg/L) (Radian, 1997). This was the only energetic detected.

3.3 Geology and Soils

UTTR-North lies in the Great Salt Lake Desert in the northeastern portion of the Basin and Range physiographic province. The province is characterized by several north-south trending mountain ranges separated by basins and valleys. The mountains are uplifted, while the valleys were formed by downfault blocking, which generally occurred at the leading edge of the valleys along the UTTR-North front faults. The valleys are generally filled with unconsolidated and partially consolidated sediments of alluvial and lacustrine origin. Much of UTTR-North consists of salt flats (mudflats), with extensive tertiary and quaternary alluvial, aeolian, and lacustrine valley fill deposits.

3.3.1 CBU Valley Alternative Action

The CBU Valley alternative MTA site is located just beyond the southwest corner of the North Valley Subarea of Sink Valley (Price and Bolke, 1970). Consolidated rock consisting primarily of limestone is present at the surface approximately 800 to 1,000 feet east of the site. This limestone outcrop separates the site from the North Valley Subarea of Sink Valley. The site is located near the boundary between the mudflats to the north, and sand and gravel deposits directly to the south. The U.S. Geological Survey (USGS) Round Mountain quadrangle indicates the elevation of the site is approximately 4,240 feet above MSL.

A review of published geologic data indicates there are no faults that had displacement in Holocene time present in the direct vicinity of the CBU Valley alternative MTA site (Hecker, 1993). However, evidence of faulting is present in the east of the limestone outcrop, approximately 1,000 feet east of the site (Doelling, 1980).

3.3.2 Doyle's Gulch Alternative Action

The Doyle's Gulch alternative MTA site is located approximately 1,200 feet east of the CBU Valley alternative MTA site and is within the southwest corner of the North Valley Subarea of Sink Valley (Price and Bolke, 1970). The site is located near the boundary between the mudflats to the north, and sand and gravel deposits directly to the south. Further south and west of the site, consolidated rock consisting primarily of limestone is present at the surface. The USGS Round Mountain quadrangle indicates the elevation of the site is approximately 4,200 feet above MSL.

In October 1997, Radian International collected surface soil samples and advanced one test boring at the site. The soil data indicated the surface cover in the direct vicinity of the site consisted of clayey silt and fine sand to a depth of approximately two feet (Core Laboratories, 1999). Beneath two feet, fine to medium sand with small to large gravel was present to the end of the boring at ten feet. Geologic information below ten feet was interpreted from well log information collected during the installation of a monitor well at the UTTR-North Target 22. Target 22 is located approximately two miles east-southeast of the Doyle's Gulch site. The well log data indicated that beneath 10 feet, unconsolidated sediments consisting of silt, sand, and gravel are present to at least 300 feet bgs.

A review of published geologic data indicates there are no faults that had displacement in Holocene time present in the direct vicinity of the Doyle's Gulch site (Hecker, 1993). However, evidence of faulting is present in the limestone outcrop approximately 400 feet west of the site (Doelling, 1980).

3.3.3 M-60 Range Alternative Action

The M-60 Range alternative MTA site is located within the central region of the North Valley Subarea of Sink Valley (Price and Bolke, 1970), along the boundary between the mudflats to the west and the northwest leading edge of the Lakeside Mountains to the east. The USGS Strongs Knob quadrangle indicates the elevation of the site is approximately 4,300 ft above MSL.

In October 1997, Radian International collected surface soil samples, and advanced one test boring at the site. The soil data indicated the surface cover in the direct vicinity of the site consisted of silt and fine sand to a depth of approximately two feet (Core Laboratories, 1997). Beneath two feet, fine-to-medium sand with varying size gravel was present to a depth of ten feet, with gravel content increasing with depth. Site-specific geologic information below ten feet was unavailable; however, well log information collected during the installation of monitor wells at the TTU, three miles east of the site, indicates unconsolidated material consisting of sand, gravel, silt, and clay are present to at least 300 feet bgs.

A review of published geologic data indicates there are no faults that had displacement in Holocene time present in the direct vicinity of the M-60 Range alternative MTA site (Hecker, 1993). However, evidence of east-west trending faults is present in the limestone outcrop approximately 1.5 miles northeast of the site (Doelling, 1980).

3.3.4 Round Mountain Alternative Action

The Round Mountain alternative MTA site is located adjacent to the southwest corner of the North Valley Subarea of Sink Valley (Price and Bolke, 1970). The USGS Round Mountain quadrangle indicates the elevation of the site is approximately 4,340 feet above MSL

In January 1999, surface soil samples were collected by Radian at the site. A grain size analysis indicates surface soil consists primarily of silt with a small percentage (less than 20) of fine sand and clay. Unpublished data obtained from the Soil Conservation Service Draft Soil Survey of Tooele County indicates the site is located with the Skumpah Silty Loam Complex. The Skumpah Complex consists primarily of well-drained basin floor and low-lake terrace deposits. Geologic information below three feet was interpreted from well log information collected during the installation of a monitor well at the UTTR-North Target 22. Target 22 is located approximately two miles east-southeast of the site. The well log data indicated that soil beneath the surface consists of unconsolidated silt, sand, and gravel to a depth of approximately 300 feet bgs.

A review of published geologic data indicates there are no faults that had displacement in Holocene time present in the direct vicinity of the Round Mountain site (Hecker, 1993). However, evidence of faulting is present in the limestone outcrop approximately 500 feet east of the site (Doelling, 1980).

3.4 Vegetation

UTTR-North lies within the Great Basin Floristic Province. Vast sagebrush-covered plains and isolated, partly forested mountains dominate this area.

The primary plant communities at UTTR-North include salt desert shrub, Great Basin sagebrush, pinyon juniper woodland, and upper montane. Vegetation is nearly nonexistent at the lowest elevations along mudflats or dry lake beds (playas). Because of the harsh environmental conditions that exist throughout the region (such as low rainfall, high temperatures, and accumulations of alkaline salts in the undrained basins), many plants of a specialized nature have evolved. A few examples of salt-tolerant plants that can withstand such harsh environmental conditions are iodine bush, pickleweed, and saltgrass.

Surface vegetation at the CBU Valley, Doyle's Gulch, and Round Mountain alternative sites consists of sparse salt desert scrub. Surface vegetation at the M-60 Range alternative site consists of sparse desert scrub and greasewood plants. The proposed observation point for the CBU Valley MTA site consists of sparse, low-lying sagebrush and grassland (Enviro-Support, 1998).

3.5 Wetlands

Wetlands located at UTTR-North comprise approximately 22,600 acres (Parsons, 1995). The largest wetland type, approximately 99 percent, is classified as pickleweed-saltgrass-glasswort community. The predominant plant species located in these wetland areas include pickleweed (*Allenrolfea occidentalis*) and saltgrass (*Distichlis spicata*), with saltgrass decreasing in prevalence nearer the mudflat boundary of the wetland area. The hydrology of the wetland areas generally includes saturated soils, watermarks, and sediment deposits.

These wetland areas form a border between lower elevation mudflat areas and upland communities. Drier soils and plant species, including greasewood, rubber rabbitbush, shadscale, and cheatgrass identify upland communities.

Differentiation between the wetland and mudflat areas is defined where the canopy cover of wetland vegetation is less than ten percent. Mudflat areas at UTTR-North equal almost 240,000 acres, which is 65 percent of the total area of UTTR-North (Parsons, 1995).

3.6 Wildlife

Wildlife diversity at UTTR-North is limited due to the harsh climate, sparse vegetation, and arid conditions. Natural resource inventories have been conducted at UTTR-North for bird and mammal populations; however, no inventories for fish or reptile distributions have been conducted.

Mammals commonly found at UTTR-North include a variety of species such as rodents, rabbits, ground squirrels, badger, kit fox, coyote, mule deer, and pronghorn antelope. The most abundant wildlife include rabbits, horn larks, meadow larks, ravens, and pronghorn antelope. A variety of habitats, including salt flats, desert shrubs, grasses, and juniper, support several birds ranging from small passerines (perching birds and songbirds), to larger birds of prey. Some smaller birds common to the area include the horned lark and sage sparrows. Birds of prey include prairie falcons, golden eagles, hawks, and burrowing owls. Mourning doves and chukar partridges are two species of game bird identified at UTTR-North.

Fifteen active golden eagle nesting territories have been identified within a ten mile radius of the proposed MTA locations. The September 1998 test detonation pads located in the Doyle's Gulch area are approximately 0.9 miles away and in direct line-of-sight of an active golden eagles' nest. The Doyle's Gulch MTA would be moved farther away from the eagles (approximately 1.3 miles) but would still be in direct line-of-sight. The CBU Valley site has an active golden eagles nest 1.6 miles away with an elevation obstruction of 26 meters. However, a second nest, located approximately 1.3 miles from this site, is in direct line-of-sight. The M-60 Range site has an active golden eagles' nest one mile away and in direct line of sight. In addition, this site is located within an area that contains the greatest golden eagle prey base identified at UTTR-North. The Round Mountain alternative MTA site has one active golden eagles' nest 1.8 miles away with an elevation obstruction of 117 meters and a second nest located 2.0 miles away and not in direct line-of-sight.

3.7 Air Quality

While UTTR-North straddles Box Elder and Tooele counties, all four alternative MTA sites are located in southern Box Elder County, adjacent to the northern border of Tooele County. Box Elder and Tooele counties have been designated as attainment areas for all the National Ambient Air Quality Standards (NAAQS), except for a portion of Tooele County near the Oquirrh Mountains, which has been designated as moderate nonattainment for sulfur dioxide (SO₂). UTTR-North does not fall within the SO₂ nonattainment area of Tooele County.

As part of Utah's federally approved air quality control program, DAQ currently implements an AO program for stationary sources of regulated pollutants. Addressing the UAC R307 requirements, this

program includes the development and issuance of AOs for various categories of equipment and operations. This program ensures that any new or modified stationary pollutant source undergoes review and approval by the agency and ensures that emissions from these activities will not adversely impact air quality, thereby allowing maintenance of air quality attainment levels.

In addition to the criteria pollutants discussed above, hazardous air pollutant (HAP) emissions can also impact public health and the environment, and are therefore regulated under federal and state air quality programs. HAPs are common pollutants that are known to have carcinogenic, chronic, or acute health impacts on humans at some level of exposure. The DAQ has established HAP ambient air impact guideline values against which calculated impacts can be compared to ascertain potential exposure. Monitoring conducted at UTTR-North for HAPs has previously indicated current air quality levels to be well within DAQ guidelines (Hill AFB, 1996).

3.8 Archaeological, Historical, and Cultural Resources

A variety of prehistoric and historic resources have been identified in the area surrounding UTTR-North. Approximately 25 cultural resource inventories have been conducted in the vicinity of both UTTR-North and UTTR-South, and several large-scale archeological excavations of dry cave sites have been carried out (Dames and Moore, 1997a).

Until 1991, most of UTTR-North had not been surveyed for any cultural resources. However, since then several intensive pedestrian surveys have covered approximately 25 percent of the range. As a result of these surveys, a better understanding of the nature and distribution of these resources is being developed. Most of the cultural sites are clustered and located in the upland and mountain areas. Virtually no sites have been identified in the mudflat regions of UTTR-North. Pedestrian inventories encompassing the alternative MTA locations have identified three potentially significant archaeological sites. Two sites are located within 0.25 miles of the CBU Valley alternative site. The third site, a potential Native American rock shelter, is located less than 0.5 miles from the Doyle's Gulch alternative MTA location.

3.9 Land Use

Historically, UTTR-North, as well as much of the land surrounding the current north and south ranges has been used for military purposes. During World War II, for example, almost six million acres of northwestern Utah were under DoD control. This number has decreased to the current amount of approximately two million acres.

Property located adjacent to UTTR-North is administered by federal and state governments and, to a limited degree, private ownership. These properties have limited economic resources or access, and minimal infrastructure. Federal lands surrounding UTTR-North are managed primarily by DoD and the Bureau of Land Management (BLM). The BLM manages the lands for multiple uses, including livestock grazing, wildlife management, mining, and recreation.

UTTR-North itself is owned, managed, and primarily utilized by the DoD. Activities conducted at UTTR-North include military personnel and weapons system training and testing, disposal of ordnance, explosives, etc., and use of facilities such as targets and test pads. The remoteness and relative isolation from populated areas, as well as limited access, makes it a safe and secure location for these military operations. The specific locations of the alternative MTA sites are not currently used directly by the DoD; however, existing operations are conducted in the vicinity of the four sites.

3.10 Noise

The Air Force is currently engaged in several operations on UTTR-North, including weapons testing, thermal treatment by OB/OD, air-to-ground weapons delivery practice, simulated air-to-air

combat, and low-altitude tactical navigation training. Noise is generated in the local environs on UTTR-North from aircraft operations, ordnance explosion, maintenance, and construction.

Noise emissions generated by military aircraft activity have been previously evaluated and documented using ROUTEMAP. This program computes noise contours using the number of flights, aircraft types, flight altitudes, speeds, and engine power settings. The resulting noise exposure is expressed in terms of monthly day-night average sound levels, adjusted for onset rate. Because the day-night average sound level noise descriptor averages sound over a period of a month, it is not significantly impacted by short-duration events such as detonation and not a good descriptor of the impact of impulsive noise events.

As a condition of its Air Quality AO for the TTU, Hill AFB implements a noise abatement plan for OD activities at UTTR-North. The TTU noise abatement plan currently in place requires noise predictions determined by computer noise modeling to be less than 134 dB in populated areas before a blast event can be executed. Populated areas are primarily those east of the Great Salt Lake, from North Ogden to Grantsville.

A “go” or “no-go” determination for a detonation event at the TTU is made based on the results of the Blast Operational Overexposure Model (BOOM) and the Sound Intensity Propagation System (SIPS) modeling performed by UTTR-North personnel prior to every scheduled detonation. A predicted peak noise level of 134 dB or greater at any populated off-site receptor location results in a “no-go” determination. By complying with the TTU noise abatement plan, impulsive noise levels at off-site receptor locations in populated areas are mitigated to 134 dB or less. The effectiveness of the noise abatement plan is demonstrated by the fact that, out of 82 Poseidon treatment operations conducted from 1994 to 1996, the only noise complaint received occurred prior to implementation of the plan.

3.11 Health and Safety

UTTR-North is a restricted military area. Access is controlled and permitted only by authorized personnel. During operations, safety zones are established to prevent access to areas that could potentially result in injury in the unlikely event of an accident or other unanticipated event. Safety procedures detailing OB/OD operations for motor transportation, handling, and treatment have been developed and are currently used at the TTU.

3.12 Transportation

Transportation routes at UTTR-North consist primarily of a limited number of unimproved roads. The Lakeside access road (Box Elder County Road) runs across the eastern section of UTTR-North, just west and parallel to the Lakeside Mountains. This road is accessible from Interstate Highway 80 and is not fenced off from the range.

Improved roads within UTTR-North boundaries are generally limited to the area directly surrounding Oasis. These roads are used by UTTR-North personnel to inspect target locations and for mobilizing existing ordnance treatment operations. Travel on these roads is monitored by dispatch to ensure personnel are not present during various military operations.

Transportation of missile motors to UTTR-North for treatment at the existing TTU is accomplished by semitrailer. The motors are secured to specially equipped trailers and delivered to UTTR-North via Interstate Highway 80 and the Lakeside access road. Existing procedures provide the necessary instructions for safe transport of the missile motors.

3.13 Socioeconomic Conditions

UTTR-North is approximately 60 miles west of Salt Lake City, Utah and lies within the northern portion of Tooele County and the western part of Box Elder County. This area is a very sparsely populated area with no incorporated communities in the vicinity of the alternative MTA sites.

Several small communities exist in the areas surrounding UTTR-North, all of which maintain populations of less than 400 people. The only significant commercial development in the immediate vicinity of UTTR-North is at Wendover, approximately 60 miles west of the alternative MTA sites. Casinos, hotels/motels, service stations, stores, and related tourist facilities are present in the towns of Wendover, Utah, and West Wendover, Nevada. The town is known primarily for its casinos and entertainment, and most of the economic activity is related to gambling (Dames and Moore, 1997a).

The relative isolation of UTTR-North limits its influence on the socioeconomic conditions of the surrounding communities. However, UTTR-North is an integral part of operations at Hill AFB and, therefore, has an effect on the socioeconomics of Salt Lake City and the communities which extend north and south along the west slope of the Wasatch Mountains (the Wasatch Front).

4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the effects the proposed action and the no-action alternative would have on existing conditions at UTTR-North. The effects or impacts can be beneficial or adverse, direct or indirect, and short-term or long-term. The impacts are discussed below with regard to each of the environments described previously in Section 3.

The proposed action, as described in Section 2, will consist of OB/OD treatment of rocket motors, as well as other munitions similar to those currently treated at the TTU, at any of four alternative locations on UTTR-North. As part of the proposed action, test demonstrations may be conducted at any one or more of the four alternative site locations for the purpose of gathering logistical and operational data prior to full MTA development. The test detonations may occur prior to final MTA site selection.

Two test demonstrations were conducted in the vicinity of the Doyle's Gulch alternative MTA site on 23 and 24 September 1998. Two second stage Trident rocket motors (total NEW of approximately 35,000 pounds) were detonated during each test. The detonation test pads were located approximately 0.9 miles from the golden eagles' nest in the area and in direct line-of-sight of the nest. The potentially significant archaeological site (the rock shelter) was less than 0.25 mile from the test pads. Noise, vibration, and soil monitoring were conducted at various locations throughout the range and at selected off-site locations along the Wasatch Front. Monitoring results are summarized in the test demonstration report (Radian, 1999b) and were used in completing this section of the EA.

4.1 Surface Water

CBU Valley Alternative Action

No significant impacts to surface water are anticipated from constructing and operating the MTA at the CBU Valley alternative action location at UTTR-North. The general scarcity of surface water in the immediate vicinity of the site makes adverse impacts unlikely. The nearest significant surface water body is the Great Salt Lake, which lies approximately ten miles to the east. Additionally, the very low amount of precipitation at UTTR-North would prevent any sediment from being carried off due to run-off.

Doyle's Gulch Alternative Action

No significant impacts to surface water are anticipated from constructing and operating the MTA at the Doyle's Gulch location at UTTR-North. As with the CBU Valley alternative, the nearest surface water, the Great Salt Lake, lies approximately ten miles to the east. The distance to the lake and the low precipitation minimize the potential impacts to surface water.

M-60 Range Alternative Action

No significant impacts to surface water are anticipated from constructing and operating the MTA at the M-60 Range site at UTTR-North. The M-60 Range site is located approximately seven miles west of the nearest shore of the Great Salt Lake. Similar to the previous alternatives, the scarcity of surface water and the low precipitation minimize the likelihood of any surface water impacts. Additionally, the site is located on a slope that would prevent runoff from entering the Great Salt Lake.

Round Mountain Alternative Action

No significant surface water impacts are anticipated from constructing and operating the MTA at the Round Mountain site at UTTR-North. The nearest significant surface water body is the Great Salt Lake, which lies approximately 11 miles to the east. Additionally, the geography of the surrounding area would prevent run-off to the Great Salt Lake.

No-Action Alternative

The no-action alternative would result in no changes to existing facilities at UTTR-North. Therefore, no impacts to surface water are expected as a result of this alternative.

4.2 Groundwater

CBU Valley Alternative Action

As part of the operation of the new MTA, a groundwater well would need to be installed near the CBU Valley alternative action site. Approximately 8,000 gallons per detonation and 3,000 gallons per burn would be used for dust suppression. It is not expected this water usage would have a significant adverse impact on groundwater quality. Additionally, it is unlikely that groundwater quality would be adversely impacted through infiltration, due to the limited amount of precipitation that falls in the area and the high potential for evapotranspiration.

Doyle's Gulch Alternative Action

A new groundwater well would need to be installed in the vicinity of the Doyle's Gulch site to supply water for MTA operations. Similar to the CBU Valley alternative, no significant impacts are anticipated from operating the MTA at the Doyle's Gulch site.

M-60 Range Alternative Action

A new groundwater well would need to be installed in the vicinity of the M-60 Range site to supply water for MTA operations. Similar to the previous alternatives, no significant impacts are anticipated from operating the MTA at the M-60 Range site.

Round Mountain Alternative Action

A new groundwater well would need to be installed in the vicinity of the Round Mountain site. Similar to the previous alternatives, no significant impacts are anticipated from MTA operations at the Round Mountain site.

No-Action Alternative

The no-action alternative would result in no changes to existing facilities at UTTR-North. Therefore, no impact to groundwater is expected as a result of this alternative.

4.3 Geology and Soils

4.3.1 Soils

CBU Valley Alternative Action

Impacts to surface soils associated with developing the MTA at the CBU Valley site would result directly from OB/OD operations. Detonating missile motors results in ejecting soil, which creates a large depression. The OD of two 16,000-pound NEW Poseidon second stage motors at the TTU resulted in a depression approximately 70 feet in diameter and 20 feet deep. Measurements were taken from the two separate test detonations of Trident I second stage motors on September 23 and September 24 (Radian, 1999b). The first test resulted in a depression with a diameter of approximately 93 feet and a depth of approximately 16 feet. The second test created a depression with a diameter of 67 feet and depth of 10 feet. The difference in crater size may be due to slightly different soil compaction characteristics at the two test pad sites.

It is anticipated that the OD of two 40,000-pound NEW Trident I first stage motors would result in a depression approximately 125 feet in diameter and 30 feet deep. Most of the ejected soil would remain in the immediate vicinity and would be used to backfill the depression. If necessary, a small amount of the required backfill material could be acquired from nearby gravel pit areas. Over the course

of 200 Poseidon detonations, virtually no additional backfill material was required at the existing TTU. Therefore, there are no significant impacts to soils expected from the proposed MTA operations.

Doyle's Gulch Alternative Action

The same impacts anticipated for soils at the CBU Valley site would be expected at the Doyle's Gulch site. The same operations would be conducted at a different location. These activities are not anticipated to result in significant adverse impacts to soil.

M-60 Range Alternative Action

The same impacts anticipated for soils at the CBU Valley site would be expected at the M-60 Range site. These activities are not anticipated to result in significant adverse impacts to soil.

Round Mountain Alternative Action

The same impacts anticipated for soils at the CBU Valley site would be expected at the Round Mountain site. These activities are not anticipated to result in significant adverse impacts to soil.

No-Action Alternative

The no-action alternative would result in no changes to existing facilities at UTTR-North. Therefore, no impact to surface soils is expected as a result of this alternative.

4.3.2 Seismic Considerations

Part of the explosive energy from a detonation is transmitted into the ground in the form of stress waves. The magnitude of the stress waves at the source of the explosion is directly proportional to the amount of explosives detonated at one time. Particle velocity is a measurement of the speed at which an individual particle of a medium moves under the influence of wave motions. Peak particle velocities observed away from the explosion decrease with distance from the location of the explosion at a rate dependent on subsurface materials and conditions. The specific magnitudes of peak particle velocity can be correlated to damage to structures and mobilization of fractured rock. Prediction of peak particle velocity is discussed in Appendix D.

Though little is known about the possibility of seismic triggering related to explosions or detonations, it has been shown that explosions that produce peak particle velocities below 12 inches per second do not cause "fall of rock in unlined tunnels" (Langefors and Kihlstrom, 1963). As shown in Appendix D, for the maximum proposed NEW of 80,000 pounds (two Stage I Trident rocket motors), a peak particle velocity of 11.71 inches per second at 400 feet from the detonation site has been calculated. Therefore, fractured rock located greater than 400 feet from the explosion should not be mobilized. In addition, since mobilization of a fault would require new cracking, even active faults more than 400 feet from the explosion would be unaffected.

The nearest known potential fault is located approximately 800 feet east of the CBU Valley alternative MTA location. This potential fault is also located approximately 400 feet west of the Doyle's Gulch alternative MTA detonation site. The nearest known potential fault at the M-60 Range alternative MTA site is over a mile from the site, and the nearest known potential fault at the Round Mountain alternative MTA site is approximately 500 feet east of the site. Therefore, there are no adverse seismic impacts anticipated from any of the proposed MTA alternatives. Vibration monitoring conducted during the September 1998 test demonstrations support the predicted peak particle velocity results (Radian, 1999b).

Under the no-action alternative, no changes to seismic considerations would be expected.

4.4 Vegetation

CBU Valley Alternative Action

Under the CBU Valley alternative action, MTA site development, road construction, and OB/OD operations, would impact some vegetation at UTTR-North. These impacts would be limited to removing vegetation in the immediate vicinity of the MTA pad (approximately 4,000 square feet), and developing approximately 0.25 miles of new road for pad access. Upgrades of existing roadways would also be required; however, upgrades would be limited to existing corridors and would not impact any vegetation. In addition, the proposed observation points along Lambert Boulevard would need to be expanded to accommodate additional vehicle parking. These activities are not expected to result in significant adverse impacts on the existing environment. The removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified at the CBU Valley site or at the proposed observation points.

Doyle's Gulch Alternative Action

MTA site development, road construction, and OB/OD operations at the Doyle's Gulch site would result in some impact to vegetation. Similar to the CBU Valley alternative, these impacts would be limited to removing vegetation in the immediate vicinity of the MTA pad and developing approximately 0.5 miles of new road for pad access. Upgrades of existing roadways would be limited to existing corridors and would not impact any vegetation. These activities are not expected to result in significant adverse impacts on the existing environment as the removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the Doyle's Gulch area.

M-60 Range Alternative Action

MTA development at the M-60 Range would have similar impacts on vegetation to those described for the previous alternatives. These impacts would be limited to removing vegetation in the immediate vicinity of the new MTA pad and developing approximately 1.5 miles of road for access to the pad. These activities are not expected to result in significant adverse impacts on the existing environment. The removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the vicinity of the M-60 Range. Upgrades of existing roadways would also be required; however, upgrades would be limited to existing corridors and not impact any vegetation.

Round Mountain Alternative Action

MTA development at the Round Mountain site would have similar impacts on vegetation to those described for the previous alternatives, but over a larger area. These impacts would include removing vegetation in the immediate vicinity of the new MTA pad and developing less than one mile of new road for access to the pad. Additional vegetative impacts would result from burying or relocating a high voltage power line and telecommunications line located along Lambert Boulevard, development of a new observation point access road, and road improvements to Lambert Boulevard.

Burying the power line at its current location would disrupt a corridor approximately 1.7 miles long. Relocating the power line would result in the disturbance of a corridor approximately 2.1 miles in length. Approximately 1.8 miles of road would be constructed from what is currently a rough, partially vegetated four-wheel-drive road from Lambert Boulevard to the proposed observation point. Road improvements to Lambert Boulevard would result in some vegetation disturbance. Unlike the previous sites, Lambert Boulevard would require significant reconstruction in some places, consisting of widening, straightening of some curves, and reducing the slope of embankments. These activities would result in the removal of a strip of vegetation several feet wide along the roadside for a distance of approximately four miles. These activities are not expected to result in significant adverse impacts on the existing

environment. The removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the vicinity of the alternative action.

No-Action Alternative

No impact to vegetation is expected as a result of the no-action alternative.

4.5 Wetlands

CBU Valley Alternative Action

No adverse impacts to wetlands are anticipated as a result of constructing and operating the MTA at the CBU Valley site. There are no wetlands located in the site vicinity.

Doyle's Gulch Alternative Action

No adverse impacts to wetlands are anticipated as a result of constructing and operating the MTA at the Doyle's Gulch site. There are no wetlands located in the site vicinity.

M-60 Range Alternative Action

No impacts to wetlands are anticipated due to implementation of the MTA at the M-60 Range site. The M-60 Range site is not located near any wetlands.

Round Mountain Alternative Action

No impacts to wetlands are anticipated due to implementation of an MTA at the Round Mountain site. The Round Mountain site is not located near any wetlands.

No-Action Alternative

No impact to wetlands is expected as a result of the no-action alternative.

4.6 Wildlife

The main natural (ecological) resource issue associated with MTA development and operations at UTTR-North concerns the golden eagles residing on the range. No other known federally protected, endangered, or threatened species or habitats exist in the vicinity of the four MTA alternative locations.

Because of the magnitude of the detonations planned for the MTA, there is a potential that site operations could adversely impact several pairs of eagles, depending on which site is selected. The primary impact of concern surrounding the local eagle population is that of increased human activity and of noise and visual impacts from the fireball generation during OD operations. Physical harm to the birds as a result of OB/OD at the MTA is highly unlikely; however, the disturbance from the OB/OD operations has the potential to disrupt feeding and breeding activities, and therefore constitute a "take" of the birds. In addition, vehicular traffic to the proposed MTA site during setup operations and increased human activity could also contribute to loss of habitat due to a modified use of established territory.

A literature review was conducted to gather information pertaining to impact of similar operations on various raptor populations (Dames and Moore, 1999b). In general, the literature review indicates that aircraft and human activities at distances greater than 600 meters (<0.5 miles) resulted in minimal responses from breeding adult and fledgling bald eagles, as found in a study by Grub and King in 1991. More pertinent to the OB/OD operations, a study at Fallon Naval Air Station measured sound intensity at several raptor nests with maximum readings of 119 dB. The golden eagle nests observed were successful in fledging young. A second study on the effect of peak noise on raptors consisted of measuring noise levels at prairie falcon nests from blasting operations. Because all explosives were detonated underground or in concrete structures, visual impacts from the blasts could not be evaluated. The average measured sound level was 136 dB with maximum sound levels of 141 dB. In this study, nesting failure did not occur; however, the study does not indicate whether or not the blasts had an impact on the bird's behavior.

The *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin, 1999) recommends a minimum buffer zone for golden eagle nests of 0.5 miles. However, due to the magnitude of the detonations associated with MTA operation, the USFW and the DWR have indicated that a further distance may be necessary to prevent disturbance to the eagles, particularly if the nest is in direct line-of-sight of the blast. The exact distance needed to avoid a disturbance is unknown.

The USFW and the DWR have agreed that there is an opportunity to gain knowledge of raptor tolerance levels by studying the eagles' behavior during detonation activities. Hill AFB is working in conjunction with the DWR to develop a two-year study to determine how the MTA operations, including increased vehicular traffic and increased human activity at the site, would affect the eagles' mating, nesting, and breeding activities. This study will be conducted regardless of which alternative MTA site is selected. The proposed study will include attaching satellite transmitters to one pair of adults and one of their young. The transmitters will be equipped with capabilities allowing for ground telemetry tracking. The study will also include a prey-base evaluation. The telemetry data that will be collected would include early dispersion data and hunting territory data. The tracking data will also help determine where the birds winter and if the young return to their nesting area the following season. The pair of eagles located at a nest in the area of UTTR-North known as Diddle Knoll will be considered the control pair for this study, because it is believed that they are far enough from the proposed detonation sites to not be affected. If the results from the two-year study indicated that there were significant adverse effects on the eagles from the MTA operations, the USFW and the DWR could require additional mitigation efforts in the future, including termination of OB/OD activities at the site.

CBU Valley Alternative Action

The MTA pads at the CBU Valley site would be located in direct line-of-sight of an eagles' nest 1.3 miles away. Impacts to the resident eagles from OB/OD operations at this site could result from increased human activity, noise, vibration, and OB/OD visibility; however, there are no data from the literature review which indicates that impulse noise, even up to 141 dB, results in any significant adverse impacts. Therefore, as determined by USFW, if detrimental impacts to golden eagle courtship/nesting activities are observed at any time during the two-year study, mitigation efforts would be employed as mandated by the Eagle Protection Act, which may include discontinuing MTA activities at the site.

Doyle's Gulch Alternative Action

Based on the September 1998 test detonation noise monitoring results at the Doyle's Gulch golden eagles' nests (Radian, 1999b), it was determined by USFW and DWR representatives and the Hill AFB Natural Resource Manager, that the impact to the nesting eagles from MTA operations at the Doyle's Gulch test pads (less than one mile away) may be of sufficient magnitude to be considered unacceptable unless mitigation efforts as mandated by the Eagle Protection Act were employed. In addition to the noise impacts, it is believed that the visual blast effects and increased human activity at that distance could startle the eagles and cause them to leave their nest. Therefore, the proposed detonation pads at the Doyle's Gulch site were relocated to approximately 1.3 miles away from the nest (see Figure 2-2).

Noise monitoring conducted during the test detonations resulted in sound levels at the eagles' nests of 153 dB to 158 dB. These sound levels should decrease at the relocated pad site due to increased distance. Observations of the resident eagles during the test detonation did not indicate that the detonation caused a disturbance of behavior, however, these tests were conducted during the non-breeding season. Eagles are likely to be more sensitive to disturbances during the courtship/nesting season.

Based on the literature review, it is inconclusive whether MTA operations at this site would have a significant impact to nesting golden eagles in the vicinity, and there has been no documentation of a significant prey population in the Doyle's Gulch area. However, it is possible that the September 1998

test pad preparation activities (i.e., vegetation removal and grading) and the test detonations may have caused habitat destruction and/or a decline in the rabbit population in the area. If at any time during the two-year study it is determined that MTA operations are having a detrimental impact on golden eagle courtship/nesting activities, mitigation efforts would be employed as mandated by the Eagle Protection Act, which may include discontinuing MTA activities at the site.

M-60 Range Alternative Action

The nearest known active golden eagles' nest to the M-60 Range alternative MTA site is approximately one mile away and in direct line-of-sight. In addition, the area along the M-60 Range has been surveyed for prey base and was found to have a significant number of jackrabbits and other small mammals, as compared to other areas of UTTR-North. Because this area likely serves as a significant source of prey for resident eagles, actions that would eliminate or reduce the prey base could be considered indirectly detrimental to eagle habitat.

Currently, there are no data available to determine if OB/OD operations at the M-60 Range site would have a detrimental impact on the healthy jackrabbit population in the area. The two-year study being conducted by the DWR will evaluate impacts to prey base as a result of MTA operations. If significant impacts to the prey base did occur, resulting in significant impacts to the golden eagles in the area, or if MTA operations were shown to have a detrimental impact on golden eagle courtship/nesting activities, mitigation efforts would be employed if MTA operations were to continue at the site. As in the previous alternatives, significant adverse impacts as determined by the USFW may make it necessary to discontinue MTA operations at this site in accordance with the Eagle Protection Act.

Round Mountain Alternative Action

The nearest active golden eagles' nest to the proposed Round Mountain MTA site is located in the Doyle's Gulch area approximately 1.75 miles away. One significant ridge exists between this site and the eagles.

Due to the distance to the eagles' nest and the significant terrain features, it is not anticipated that operation of the MTA at the Round Mountain site would have any significant adverse impacts on the eagles at UTTR-North. Other than the incidentally observed cottontail rabbits residing on the surrounding slopes, there has been no documentation of a significant prey population in the Round Mountain area.

No-Action Alternative

The no-action alternative would result in no changes to existing facilities at UTTR-North. No impact to wildlife or habitat is expected as a result of this alternative.

4.7 Air Quality

Air dispersion modeling was performed to support both this EA and a draft NOI for obtaining an Air Quality AO for MTA operations. The Air Impact Modeling Methodology used to determine emissions and air quality impacts is described in Appendix E. For modeling purposes, the Doyle's Gulch alternative MTA site was selected, due to its central location in relation to the other alternative locations. Due to the relative proximity of the four alternative locations and because of the similarities in terrain and wind regimes, along with the distance to the nearest property boundary, modeling results are expected to be similar for all four sites.

Table 4-1 shows the emissions, in pounds per year, expected from the proposed MTA operations. It is assumed that the allowable treatment period will be February 22 through December 19 of each year, as it is in the AO for ongoing TTU operations. This treatment period was established due to regional weather conditions. OD emission results are based on 80,000 pounds NEW of Class 1.1 propellant per treatment event and three treatment events occurring per week during the treatment period. OB emissions are based on 100,000 pounds NEW per burn, with one OB event per week (Radian, 1998b).

Table 4-1. Estimated Annual Emissions from MTA OB/OD Operations

Activity: Species	Open Detonation ^a		Open Burn ^b	
	Pounds	Tons	Pounds	Tons
PM ₁₀	427,056	213.5	129,114	64.6
Metals	241,656	120.8	16,364	8.2
Cl ₂	1,031	0.5	199	0.1
HCl	32,476	16.2	90,194	45.1
CO	29,574	14.8	46,425	23.2
NO _x	152,470	76.2	32,336	16.2
VOCs	2,261	1.1	12,808	6.4
TNMHC	2,261	1.1	12,808	6.4
SVOCs	448	0.2	-	-

^a Based on 80,000 pounds/event and 123 events/year.

^b Based on 100,000 pounds/event and 41 events/year.

PM₁₀ = Particulate matter less than 10 microns; Cl₂ = Chlorine; HCl = Hydrogen chloride; CO = Carbon monoxide; NO_x = Nitrogen oxides; VOCs = Volatile organic compounds; TNMHC = Total nonmethane hydrocarbons; SVOCs = Semi-volatile organic compounds.

Table 4-2 shows the dispersion modeling results for the maximum modeled concentrations at the UTTR-North property boundaries from MTA OB/OD activities. The impacts are indicated for short-term averaging periods (1-hour and 24-hour), except for NO₂, which is the annual impact. The maximum impacts occur at the southern boundary of UTTR-North between the Doyle's Gulch and the M-60 Range MTA sites. As shown in the table, all impacts are less than the respective ambient air quality standards, thereby demonstrating maintenance of current air quality levels. As the distance to the nearest property boundary is extensive, the impacts continue to decrease quickly away from the UTTR-North boundary as the treatment event cloud dissipates with time and distance.

The dispersion modeling results are conservative, as the modeled number of treatment events will rarely, if ever, occur, due to weather conditions and other operational constraints. Based on this modeling, the maximum NEW of 80,000 pounds per OD event and 100,000 pounds per OB event will not be treated every event. Therefore, no adverse impacts to air quality are expected from conducting OB/OD operations at any of the alternative MTA locations. In addition, none of the alternatives are projected to cause ambient air quality standards to be exceeded or pose any threat to public health.

No-Action Alternative

The no-action alternative would not result in any additional air emissions. Therefore, current levels would not be affected.

4.8 Archaeological, Historical, and Cultural Resources

CBU Valley Alternative Action

Impacts to archaeological, historical, and cultural resources as a result of MTA operations at the CBU Valley location were evaluated for this EA. Two potentially significant archaeological sites were identified within 0.25 miles of the CBU Valley alternative MTA location. Two state-permitted prehistoric archaeologists were contacted to determine if the detonations could have an adverse affect on cultural resources at such a site. It is uncertain if the ground vibrations would impact any subsurface deposits. However, the cumulative impacts of the gradual movement of topsoil due to the air blasts, as well as adverse secondary actions (i.e., increased traffic and activities in the area) could adversely impact the site resources.

Table 4-2. Maximum Modeled Concentrations from MTA OB/OD Activities

Compound	Air Quality Standard UDEQ HAP (TSL) or NAAQS ^a (µg/m ³)	Emission Factors (mass/mass of propellant)	Open Detonation			Emission Factors (mass/mass of propellant)	Open Burning		
			1-hour Concentration (µg/m ³)	24-hour Concentration (µg/m ³)	Annual Concentration (µg/m ³)		1-hour Concentration (µg/m ³)	24-hour Concentration (µg/m ³)	Annual Concentration (µg/m ³)
PM ₁₀	150 (24-hour)	1.53E-01	6.55E+02	2.73E+01	1.16E+00	3.149E-02	1.75E+03	1.51E+01	1.81E+00
Manganese	6.7 (24-hour)	1.39E-04	5.96E-01	2.48E-02	1.05E-03	1.315E-06	1.59E+00	6.28E-04	1.65E-03
Phosphorus	3.3 (24-hour)	1.36E-04	5.83E-01	2.43E-02	1.03E-03	2.90E-05	1.56E+00	1.38E-02	1.61E-03
Antimony	16.7 (24-hour)	5.61E-05	2.41E-01	1.00E-02	4.25E-04	1.47E-05	6.44E-01	7.04E-03	6.65E-04
Chromium	16.7 (24-hour)	2.48E-05	1.06E-01	4.42E-03	1.87E-04	4.58E-07	2.84E-01	2.19E-04	2.93E-04
Nickel	1.7 (24-hour)	2.26E-05	9.69E-02	4.04E-03	1.71E-04	1.26E-06	2.59E-01	6.04E-04	2.68E-04
Arsenic	0.3 (24-hour)	2.33E-06	9.98E-03	4.16E-04	1.76E-05	1.909E-07	2.67E-02	9.12E-05	2.76E-05
Cobalt	0.7 (24-hour)	1.69E-06	7.24E-03	3.02E-04	1.28E-05	1.78E-07	1.94E-02	8.51E-05	2.00E-05
Beryllium	0.1 (24-hour)	1.57E-07	6.72E-04	2.80E-05	1.19E-06	1.65E-08	1.80E-03	7.91E-06	1.86E-06
Mercury	0.3 (24-hour)	2.49E-08	1.07E-04	4.45E-06	1.89E-07	2.32E-08	2.86E-04	1.11E-05	2.95E-07
Cl ₂	50.0 (24-hour)	1.05E-04	4.51E-01	1.88E-02	7.97E-04	4.84E-05	1.20E+00	5.01E-02	1.24E-03
HCl	750.0 (1-hour)	3.30E-03	1.42E+01	5.93E-01	2.51E-02	2.20E-02	3.79E+01	1.58E+00	3.91E-02
CO	900 (8-hour)	3.01E-03	1.29E+01	5.40E-01	2.29E-02	1.13E-02	3.45E+01	1.44E+00	3.56E-02
NO _x	186.7 (annual)	1.55E-02	6.67E+01	2.78E+00	1.18E-01	7.89E-03	1.78E+02	7.41E+00	1.84E-01
Methylenechloride	5800.0 (24-hour)	6.21E-03	2.67E+01	1.12E+00	4.73E-02	3.68E-04	7.12E+01	2.97E+00	7.36E-02
Naphthalene	1733.3 (24-hour)	6.31E-05	2.72E-01	1.13E-02	4.80E-04	2.30E-05	7.24E-01	3.02E-02	7.48E-04
m-Xylene & p-Xylene	14466.7(24-hour)	1.39E-05	5.99E-02	2.50E-03	1.06E-04	2.44E-05	1.60E-01	6.65E-03	1.65E-04
Toluene	6266.7(24-hour)	9.69E-06	4.17E-02	1.74E-03	7.37E-05	2.96E-05	1.11E-01	4.63E-03	1.15E-04
Benzene	32.0(24-hour)	9.70E-06	4.17E-02	1.74E-03	7.38E-05	1.19E-04	1.11E-01	4.63E-03	1.15E-04
Chloroform	1633.3(24-hour)	6.82E-06	2.93E-02	1.22E-03	5.19E-05	6.17E-07	7.82E-02	3.26E-03	8.08E-05
o-Xylene	14466.7(24-hour)	5.19E-06	2.23E-02	9.31E-04	3.95E-05	2.09E-05	5.95E-02	2.48E-03	6.15E-05
Acrolein	7.7(24-hour)	2.11E-06	9.06E-03	3.78E-04	1.60E-05	1.32E-05	2.41E-02	1.01E-03	2.50E-05
Carbontetrachloride	1033.3(24-hour)	1.93E-06	8.32E-03	3.47E-04	1.47E-05	1.31E-06	2.22E-02	9.24E-04	2.29E-05
Chlorobenzene	1533.3 (24-hour)	1.57E-06	6.78E-03	2.83E-04	1.20E-05	8.19E-07	1.81E-02	7.53E-04	1.87E-05
Styrene	2833.3 (24-hour)	1.37E-06	5.88E-03	2.46E-04	1.04E-05	2.02E-06	1.57E-02	6.53E-04	1.62E-05
1,3-Butadiene	146.7 (24-hour)	1.23E-06	5.29E-03	2.21E-04	9.36E-06	2.50E-07	1.41E-02	5.88E-04	1.46E-05
Acetonitrile	2233.3 (24-hour)	9.50E-07	4.09E-03	1.71E-04	7.23E-06	1.32E-06	1.09E-02	4.54E-04	1.13E-05
2-Butanone	19666.7 (24-hour)	7.42E-07	3.19E-03	1.33E-04	5.65E-06	1.15E-06	8.51E-03	3.55E-04	8.79E-06
Acrylonitrile	143.3 (24-hour)	7.25E-07	3.12E-03	1.30E-04	5.52E-06	1.25E-06	8.31E-03	3.46E-04	8.59E-06

^aUtah Hazardous Air Pollutant Standards, TSLs, are based on 1/10th of the TLV-Ceiling Value for acute substances and 1/30th of the TLV-TWA Value for chronic substances. Modeled concentrations at nearest property boundary to the Doyle's Gulch site.

Prior to detonation activities, the archaeological sites would need to be tested for significance. If substantial subsurface cultural deposits were identified during the testing, the site would need to be mitigated prior to the start of routine detonation operations. Mitigation would include data recovery, data analysis, and report preparation to document the site activities and findings.

The testing efforts described above would be implemented if this site were selected for the proposed MTA operations. If test results indicated that these were significant archaeological sites, mitigation efforts would need to be employed in order to avoid adverse cultural impacts. A mitigation plan would need to be developed and submitted to the State Historic Preservation Office (SHPO) for approval prior to initiating mitigation activities. If these steps are followed, no adverse impacts to cultural resources are expected from the proposed MTA operations at the CBU Valley site.

Doyle's Gulch Alternative Action

One potentially significant archaeological site, a rock shelter, was identified within 0.5 miles of the Doyle's Gulch alternative MTA location. Prior to detonation activities at Doyle's Gulch, the rock shelter site would need to be tested for significance. If substantial subsurface cultural deposits were identified during the testing, the site would need to be mitigated prior to the start of routine detonation operations. Mitigation would include data recovery, data analysis, and report preparation to document the site activities and findings.

The testing efforts discussed above would be implemented if this site were selected for MTA operations. If test results indicated that the rock shelter was a significant archaeological site, mitigation efforts would need to be employed in order to avoid adverse cultural impacts. A mitigation plan would need to be developed and submitted to the SHPO for approval prior to initiating mitigation activities. If these steps are followed, no adverse impacts to cultural resources are expected from MTA operations at the Doyle's Gulch alternative action site.

M-60 Range Alternative Action

No significant adverse impacts to archaeological, historical, or cultural resources are expected as a result of MTA operations at the M-60 Range location. Pedestrian surveys of the area have not identified any significant resources that would be impacted by MTA operations. If any significant artifacts are discovered during construction activities, work would be stopped until the proper assessment of the situation can be made. The SHPO would be contacted to act in an advisory capacity.

Round Mountain Alternative Action

No significant adverse impacts to archaeological, historical, or cultural resources are expected as a result of the MTA operations at the Round Mountain location. A pedestrian survey of the site was conducted on January 19, 1999. No cultural resources were identified (Dames & Moore, 1999a). An archaeologist would be on-site during power line burial or relocation and road construction. If any significant artifacts are discovered during construction activities, work would be stopped until the proper assessment of the situation could be made. The SHPO would be contacted to act in an advisory capacity.

No-Action Alternative

Under this alternative, no modifications or development would take place. No impacts to any archaeological, historical, or cultural resources would result from the no-action alternative.

4.9 Land Use

In general, land usage at UTTR-North is designated for the purpose of military testing, training, and ordnance treatment. Developing the MTA for OB/OD treatment is consistent with the ordnance disposal treatment function of UTTR-North.

CBU Valley Alternative Action

The CBU Valley alternative action site is not currently used for any specific training, testing, or treatment functions. However, coordination between UTTR-North staff and Hill AFB's 388th and 419th Fighter Wings would be necessary to minimize the impact of OB/OD operations on existing DoD aerial missions in adjacent areas. It is not expected that these missions would be impacted by MTA operations. Coordinating activities can be accomplished by communicating schedules between the flight commanders and UTTR-North staff. Therefore, developing and operating the MTA at CBU Valley would not result in any significant adverse land-use impacts.

Doyle's Gulch Alternative Action

Similar to the CBU Valley site, Doyle's Gulch is not currently used for any specific training, testing, or treatment functions. However, schedule coordination between the various UTTR-North users would minimize the impact of OB/OD operations on existing DoD aerial missions in adjacent areas. Therefore, developing and operating the MTA at Doyle's Gulch would not result in any significant adverse land-use impacts.

M-60 Range Alternative Action

Developing the MTA near the M-60 range is consistent with UTTR-North land usage designation. However, this alternative site location is near the existing M-60 and 40 millimeter (mm) grenade target range and the helicopter air gunnery (HAG) range. It would be necessary to coordinate OB/OD operations at this site with missions that currently utilize the existing targets.

Land space is available to enable the relocation of the M-60 and grenade range, such that these operations do not interfere with OB/OD motor treatment, however closure of this range might trigger RCRA closure requirements for the site. Aerial missions consisting of air to ground targets and the HAG would require coordination with MTA OB/OD operations. Due to the required flight paths of these aerial missions, OB/OD could not be conducted while aircraft are flying missions in the area. Coordination between UTTR-North personnel and aerial mission commanders would be necessary to ensure safe operations.

Round Mountain Alternative Action

Developing the MTA near the Round Mountain site is consistent with UTTR-North land usage designation; however, coordination between UTTR-North staff and Hill AFB's 388th and 419th Fighter Wings would be necessary to minimize the impact of OB/OD operations on these existing DoD aerial missions. This coordination is the same as identified for the CBU Valley and the Doyle's Gulch sites. Coordinating activities can be accomplished by communicating schedules between the flight commanders and UTTR-North staff. Therefore, development and operation of the MTA at the Round Mountain site would not result in any significant adverse land-use impacts.

No-Action Alternative

No land-use impacts would be experienced as a result of the no-action alternative. No changes to the existing land use would occur.

4.10 Noise

Environmental noise associated with construction activities at the proposed and alternative MTA sites would be removed from any populated area, would only occur during normal working hours, and would dissipate rapidly with distance from the source. On completion of the construction activities, no permanent impact by engine noise is anticipated. Therefore, environmental noise impact associated with MTA construction was not further evaluated.

The NSWC has completed a preliminary assessment of the potential noise impacts to off-site receptors from MTA operations. Modeling was conducted using the SIPS program (NSWC, 1997) for the detonation of various combinations of rocket motors. Table 4-3 shows the expected dB levels versus distance by NEW of Class 1.1 propellant for different treatment combinations of Trident I first and second stage rocket motors. These calculations assume worst-case meteorological conditions, ignore the effects of topography and focusing, and assume a TNT equivalent factor of 1.25 for the C-4 motors. Per the guidelines shown in Table 4-4, the risk of complaints associated with a predicted sound level of 130 dB or less is considered to be low to moderate

CBU Valley Alternative Action

The CBU Valley alternative MTA site lies to the west-southwest of the existing TTU, at a greater distance from the Great Salt Lake than the TTU. This increased distance reduces potential refraction from the water's surface and decreases the visibility of the plume from off-site receptor locations.

Based on the results shown in Table 4-3, during worst-case weather conditions, dB levels at the nearest installation boundary (eight kilometers [km]) will exceed 130 dB during OD activities for most rocket motor combinations. At a distance of 20 km or more, no combination exceeds 130 dB. However, compliance with the current TTU noise abatement plan at the proposed MTA will minimize the impact to off-site human receptors in populated areas (see Section 3.10). Consistent with the TTU noise abatement plan, if predicted noise levels associated with MTA operations exceed 134 dB at any off-site location, a "no-go" determination will be made, and OD operations will not take place for that day.

Doyle's Gulch Alternative Action

Similar to the CBU Valley alternative MTA site, the Doyle's Gulch alternative MTA site lies to the west-southwest of the existing TTU, at a greater distance from the Great Salt Lake. This increased distance reduces potential refraction from the water's surface and decreases the visibility of the plume from off-site receptor locations. As with the previous action, compliance with the current TTU noise abatement plan at the alternative MTA site will minimize the impact to off-site human receptors in populated areas. If predicted noise levels associated with MTA operations exceed 134 dB at any off-site location, a "no-go" determination will be made, and OD operations will not take place for that day.

M-60 Range Alternative Action

The M-60 Range alternative MTA location lies to the west of the existing TTU, farther from the Great Salt Lake, thereby reducing potential refraction from the water's surface and decreasing visibility of the plume from off-site receptors in populated areas. Expected dB levels calculated by NSWC predict that during worst-case weather conditions, noise levels at the nearest UTTR-North boundary (6.4 km) will exceed 130 dB for most rocket motor combinations. However, compliance with the current noise abatement plan will minimize the impact to off-site human receptors. If predicted noise levels associated with the MTA operations exceed 134 dB at any off-site location, a "no-go" determination will be made, and OD operations will not take place for that day.

Round Mountain Alternative Action

The Round Mountain Site alternative MTA location lies to the southwest of the existing TTU, also at a greater distance from the Great Salt Lake, reducing potential refraction from the water's surface and decreasing visibility of the plume from off-site receptors in populated areas. Expected dB levels calculated by NSWC predict that during worst-case weather conditions, noise levels at the nearest installation boundary (5.5 km) will exceed 130 dB for most combinations. However, compliance with the current noise abatement plan will minimize the impact to off-site human receptors. If predicted noise levels associated with the MTA operations exceed 134 dB at any off-site location, a "no-go" determination will be made, and OD operations will not take place for that day.

Table 4-3. Expected Decibel (dB) Level versus Distance

Distance (km)	Distance (miles)	One C-4 Second Stage (dB) ^a	One C-4 First Stage (dB) ^b	Two C-4 First Stage (dB) ^c	One C-4 First and Second Stage (dB) ^d
5	3.1	142.09	142.76	145.62	144.22
10	6.2	133.53	134.20	137.05	135.66
15	9.3	128.52	129.19	132.04	130.65
20	12.4	124.96	125.63	128.49	127.09
25	15.5	122.21	122.88	125.73	124.34
30	18.6	119.95	120.62	123.48	122.08
35	21.7	118.05	118.72	121.57	120.18
40	24.9	116.40	117.07	119.92	118.53
45	28.0	114.95	115.61	118.47	117.07
50	31.1	113.64	114.31	117.17	115.77
55	34.2	112.47	113.13	115.99	114.59
60	37.3	111.39	112.06	114.91	113.52
65	40.4	110.40	111.07	113.93	112.53
70	43.5	109.49	110.16	113.01	111.61
75	46.6	108.63	109.30	112.61	110.76
80	49.7	107.84	108.51	111.36	109.96
85	52.8	107.09	107.76	110.61	109.21
90	55.9	106.38	107.05	109.90	108.51
95	59.0	105.71	106.38	109.24	107.84
100	62.1	105.08	105.75	109.60	107.21
110	68.4	103.90	104.57	107.43	106.03
120	74.6	102.83	103.50	106.35	104.95

Note: Predictions ignore topography and focusing.

^aTwo C-4 Second Stage motors 42,500 pounds TNT equivalent.

^bOne C-4 First Stage motors 50,000 pounds TNT equivalent.

^cTwo C-4 First Stage motors 100,000 pounds TNT equivalent.

^dOne Each C-4 First and Second Stage motors 71,250 pounds TNT equivalent.

dB = Decibels

km = Kilometers(s)

Table 4-4. Impulse Noise Guidelines

Predicted Sound Level (dB)	Risk of Complaints
< 115	Low.
115 – 130	Moderate.
130 – 140	High; with possible complaints of damage.
> 140	High risk of physiological and structural damage claims; threshold of permanent damage to unprotected human ears.

Notes: dB = Decibels

No-Action Alternative

The no-action alternative is defined as no construction, or operation of, a new MTA. Assuming mission requirements increase nonetheless, the no-action alternative could result in increased operations at the TTU. The TTU is the least desirable location with regard to potential environmental noise impact to human receptors (human health and annoyance). If the NEW limits of TTU increase, peak sound levels would increase. However, the noise mitigation plan currently in effect for the TTU would continue to be used, so no adverse noise impacts to off-site receptors would be expected.

4.11 Health and Safety

Health and safety considerations associated with the proposed action consist of short-term site development impacts and long-term OB/OD operations impacts. These impacts are identical to those associated with existing operations at the TTU. Site development health and safety concerns are related to large equipment operation and minor earth moving operations.

The health and safety impacts associated with long-term OB/OD operations consist of hazards resulting from transporting and handling large explosive materials, actual motor treatment, air quality impacts, and associated contaminant deposition on off-site soils. All of the OB/OD operations are currently performed at the TTU, and therefore, only minor changes to existing health and safety procedures would be necessary for MTA operations. In addition, a draft health risk assessment of the proposed action (Radian, 1998a) indicates that human health and ecological receptor risk will not exceed acceptable thresholds. Therefore, no significant adverse health and safety impacts are expected from constructing and operating the MTA at any of the alternative MTA locations. However, due to the presence of aboveground power lines in the vicinity of the Round Mountain MTA site, mitigation efforts would be required to avoid safety concerns associated with this high voltage power line. This is discussed further below.

Round Mountain Alternative Action

Conducting OB/OD operations at the Round Mountain site would require the relocation or burying of approximately 1.7 to 2.1-miles of aboveground, high-voltage power lines, because of their proximity to the proposed pad location. The power line is approximately 1,640 feet from the nearest point of the pad. The required safety factor (K-factor) for aboveground power lines is $K=105$, to ensure OB/OD operations do not damage the power lines. To obtain this safety factor for aboveground installation, the power lines would have to be 4524 feet from the nearest point of the pad. Approximately 2.1 miles of line would have to be relocated southwest of the road. For installation below grade, a safety factor of $K=30$ to 50 may be necessary. If a K-factor of 50 is required,, approximately 1.7 miles of power line would need to be buried. It is not expected that relocation or burial of these power lines would result in any significant adverse health and safety impacts. A telecommunication line is located below ground in the same corridor as the high-voltage power line. Assuming the current depth is adequate, no change to its location would be necessary.

No-Action Alternative

Under the no-action alternative, it is possible that increased demilitarization requirements would result in an increase in storage of missile motors. Significant safety concerns would need to be addressed to provide storage for demilitarized missiles. Acts of nature such as lightning strikes or fire pose the potential for accidental ignition of stored missile motors.

A second safety risk associated with missile storage consists of propellant stability. As time passes, stabilizing agents within the missile propellant break down. For this reason, an expiration date is provided for such munitions, at which point the motor is either refurbished or removed from service for demilitarization. Storage of these decommissioned munitions for extended time periods could result in increased safety risks.

The no-action alternative would result in an increased potential for significant impacts to the health and safety of personnel at the associated missile storage facilities.

4.12 Transportation

CBU Valley Alternative Action

Access to the MTA at the CBU Valley alternative MTA site would require developing less than 0.25 miles of road from Doyle's Gulch Road to the proposed pad site. This road section would be used to provide access for missile motor transportation and placement for treatment operations. From March through September, access to the CBU Valley site for MTA operations would be via Checkpoint Alpha or Checkpoint Charlie. These activities would not impact existing transportation at UTTR-North.

Road access would be restricted during all OB/OD operations to maintain the required two-mile radius safety-buffer zone. Road closures would consist of Charlie Road and the Doyle's Gulch Road at Checkpoint Alpha, and Charlie Road at Pad 4. Closing these roads will have a small impact on travel within UTTR-North. However, these roads are not thoroughfares and will only be barricaded during OB/OD operations. Communication and scheduling will be sufficient to minimize the impact of these road closures.

Doyle's Gulch Alternative Action

Access to the MTA at the Doyle's Gulch site would require developing less than 0.5 miles of road from Doyle's Gulch Road to the pad site. This road section would be used to provide access for missile motor transportation and placement for treatment operations. Road access would be restricted during all OB/OD operations to maintain the two-mile radius buffer zone. Because of the proximity of the Doyle's Gulch alternative action location to the CBU Valley proposed action location, transportation impacts would be similar. Road closures would consist of Charlie Road and the Doyle's Gulch Road at Checkpoint Alpha, and Charlie Road at Pad 4. Closing these roads will have a small impact on travel within UTTR-North as they will only be barricaded during OB/OD operations.

M-60 Range Alternative Action

Developing the MTA at the M-60 Range site would result in some impacts to transportation within UTTR-North. These impacts include new road development and possible future impacts to a railroad spur line that may be constructed in the area, which comprises the M-60/Little Pappa Range. However, it is not expected that these impacts would have a significant adverse impact on transportation at UTTR-North.

Similar to the previous alternatives, some road closures would be required during OB/OD operations at the MTA. Road closure would consist of closing gates on Ash Street at the Artic Road intersection and closing both Lambert Boulevard and Doyle's Gulch Road at Checkpoint Alpha. These roads are not thoroughfares and would only be closed during OB/OD operations. Communications and scheduling will be sufficient to minimize the impact of these road closures.

Round Mountain Alternative Action

Developing the MTA at the Round Mountain site would result in some impacts to transportation within UTTR-North. These impacts include new road development and rebuilding approximately 4 miles of Lambert Boulevard to provide a safe road for transportation of the rocket motors to the MTA. It is not expected that these impacts would have a significant adverse impact on transportation at UTTR-North. Lambert Boulevard is currently used for vehicular traffic; a complete new road would not need to be built, rather improvements to the existing road, such as widening, and possibly resurfacing (pavement/asphalt), would be necessary.

Similar to the other MTA alternatives, some road closures would be required during OB/OD operations at the MTA. Road closures would include Lambert Boulevard at the observation point turnoff, just before the gravel pit, Charlie Road approximately 1.5 miles west of Checkpoint Alpha, and Charlie Road at Pad 4. These roads would only be closed during OB/OD operations. Communications and scheduling will be sufficient to minimize the impact of these road closures.

No-Action Alternative

Under the no-action alternative, existing operations at the TTU would continue, and no impacts beyond existing OB/OD related road closures would be experienced. However, prolonged usage of the TTU may be necessary under this alternative, which would result in continued closures of the county road that runs through UTTR-North.

4.13 Socioeconomic Conditions

It is not expected that the additional workload at UTTR-North would have a significant impact on the socioeconomics of the area, although operations at UTTR-North provide a significant support function to Hill AFB and, therefore, impact the overall operation of the Base. The additional workload will not likely result in additional jobs or business opportunities to the local economies. Additionally, due to the rural nature of the surrounding areas, no significant adverse or beneficial impact is expected.

No-Action Alternative

Under the no-action alternative, OB/OD operations at the existing TTU would continue, and no impacts to the existing socioeconomics of the area would be expected.

4.14 Environmental Justice

Environmental justice analyses for NEPA documents attempt to determine whether a proposed action disproportionately impacts minority and poor populations. However, because UTTR-North is not located adjacent to such groups, and because the proposed action does not result in significant adverse impacts, no such analysis was conducted.

4.15 Cumulative Impacts

Because the proposed action will augment existing operations at the current TTU, there is the potential for cumulative effects from simultaneous or overlapping operations at the two treatment areas. The actions at the TTU have been permitted under separate analyses and were done so after a finding of no adverse impact to air quality. The potential interaction and commingling of emitted plumes/puffs from simultaneous activity at the MTA and the TTU is unlikely. This is primarily due to the physical distance between the areas and the difference in initial release heights (i.e., site elevations). In addition, safety personnel would most likely be available to perform only one OB/OD event at a time due to manpower constraints. Travel times to the nearest ambient air boundary will be similar, as will the general atmospheric conditions controlling dispersion of the plume/puff. Therefore, the potential for short-term averaging period interaction is likely minimal.

On an annual basis, repeated operations at the MTA and the TTU could result in cumulative ambient impacts. A draft risk assessment (Radian, 1998a) has been prepared for MTA operations. This assessment evaluated the cumulative impacts to human health and ecological receptors as a result of operating both the MTA and the TTU at UTTR-North. Based on the results of this assessment, it was determined that, in addition to current operations at the TTU, the proposed operations at the MTA would not cause an exceedance of acceptable human health and ecological risk levels. Therefore, it is not expected that operating both the TTU and the MTA would result in any significant adverse impacts.

4.16 Summary of Impacts

A summary of the impacts described in this section is provided in Table 4-5. Based on current land use designations and the physical environment of UTTR-North, no significant adverse impacts to

geology, soils, surface water, groundwater, wildlife, or vegetation are expected. Noise impacts to off-site receptors has been successfully mitigated through noise modeling conducted for existing TTU operations. Similar noise modeling would be conducted for MTA operations. Air impacts have been shown to be acceptable based on air dispersion modeling results. Potential impacts to archaeological sites would be mitigated as required, and impacts to golden eagles would also be mitigated if study results show this is necessary. Therefore, if mitigation efforts are employed as necessary, it is not anticipated that developing an MTA at any of the alternative sites would have significant adverse environmental impacts. However, it is possible that mitigation efforts at the CBU Valley site, the Doyle's Gulch site, or the M-60 Range site, may include discontinuing MTA activities at those sites if the results of the eagle study showed that OB/OD operations were causing significant disturbance to the golden eagles at UTTR-North.

Under the no-action alternative, increasing the DoD workload would require additional operations at the TTU and possible buildup of stored munitions. Failure to treat these munitions could result in stockpiling of motors, resulting in a START violation. Additionally, as munitions reach their expected shelf-life, they may become unstable. Unanticipated events such as fire, lightning strike, or other accidents could result in additional safety concerns. Under this alternative, the stability of stored missiles will only decrease as motors are kept in storage.

Table 4-5. Anticipated Environmental Consequences from MTA Operations

Environmental Issues	CBU Valley Proposed Action	Doyle's Gulch Alternative Action	M-60 Range Alternative Action	Round Mountain Alternative Action	No-Action Alternative
Surface Water	No anticipated impact. There are no surface waters located in the vicinity of the proposed action.	No anticipated impact. There are no surface waters located in the vicinity of the proposed action.	No anticipated impact. There are no surface waters located in the vicinity of the proposed action.	No anticipated impact. There are no surface waters located in the vicinity of the proposed action.	No anticipated impact. There would be no changes to the existing facilities at UTTR-North.
Groundwater	No significant impact to groundwater quality from infiltration due to limited precipitation at the site. A groundwater well would be developed to provide water for dust suppression (approximately 8,000 gallons per detonation and 3,000 gallons per burn).	No significant impact to groundwater quality from infiltration due to limited precipitation at the site. A groundwater well would be developed to provide water for dust suppression (approximately 8,000 gallons per detonation and 3,000 gallons per burn).	No significant impact to groundwater quality from infiltration due to limited precipitation at the site. A groundwater well would be developed to provide water for dust suppression (approximately 8,000 gallons per detonation and 3,000 gallons per burn).	No significant impact to groundwater quality from infiltration due to limited precipitation at the site. A groundwater well would be developed to provide water for dust suppression (approximately 8,000 gallons per detonation and 3,000 gallons per burn).	No anticipated impact. There may be extended use of the TTU for OD activities if the MTA is not developed, but groundwater usage is not expected to exceed current rates.
Geology and Soils	No significant impact. Ejected soils would be used as backfill for detonation craters. Based on the distance to the nearest known potential fault, there are no seismic concerns.	No significant impact. Ejected soils would be used as backfill for detonation craters. Based on the distance to the nearest known potential fault, there are no seismic concerns.	No significant impact. Ejected soils would be used as backfill for detonation craters. Based on the distance to the nearest known potential fault, there are no seismic concerns.	No significant impact. Ejected soils would be used as backfill for detonation craters. Based on the distance to the nearest known potential fault, there are no seismic concerns.	No anticipated impact. There would be no changes to the existing facilities at UTTR-North.
Vegetation	Impacts associated with construction activities in currently undeveloped areas would occur. However, removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the area.	Impacts associated with construction activities on currently undeveloped areas would occur. However, removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the area.	Impacts associated with construction activities on currently undeveloped areas would occur. However, removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the area.	Impacts associated with construction activities on currently undeveloped areas would occur. However, removed vegetation would consist of common grasses and shrubs found throughout UTTR-North. No endangered plant species have been identified in the area.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Wetlands	No anticipated impacts. There are no wetlands located in the vicinity of the proposed action.	No anticipated impacts. There are no wetlands located in the vicinity of the proposed action.	No anticipated impacts. There are no wetlands located in the vicinity of the proposed action.	No anticipated impacts. There are no wetlands located in the vicinity of the proposed action.	No impact. There are no wetlands located in the vicinity of the TTU.

Table 4-5. (continued)

Environmental Issues	CBU Valley Proposed Action	Doyle's Gulch Alternative Action	M-60 Range Alternative Action	Round Mountain Alternative Action	No-Action Alternative
Wildlife	Potentially significant adverse impacts to wildlife may occur. However, any mitigation efforts recommended during, or as a result of, the two-year eagle study would be implemented as necessary. Mitigation may include termination of MTA activities at the site, if appropriate.	Potentially significant adverse impacts to wildlife may occur. However, any mitigation efforts recommended during, or as a result of, the two-year eagle study would be implemented as necessary. Mitigation may include termination of MTA activities at the site, if appropriate.	Potentially significant adverse impacts to wildlife may occur. However, any mitigation efforts recommended during, or as a result of, the two-year eagle study would be implemented as necessary. Mitigation may include termination of MTA activities at the site, if appropriate.	No significant adverse impacts to wildlife are expected. Any mitigation efforts recommended during, or as a result of, the two-year eagle study would be implemented as necessary.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Air Quality	No significant adverse impacts to air quality are expected. Air dispersion modeling has shown that neither federal ambient air quality criteria nor state air quality standards would be exceeded from proposed MTA operations.	No significant adverse impacts to air quality are expected. Air dispersion modeling has shown that neither federal ambient air quality criteria nor state air quality standards would be exceeded from proposed MTA operations.	No significant adverse impacts to air quality are expected. Air dispersion modeling has shown that neither federal ambient air quality criteria nor state air quality standards would be exceeded from proposed MTA operations.	No significant adverse impacts to air quality are expected. Air dispersion modeling has shown that neither federal ambient air quality criteria nor state air quality standards would be exceeded from proposed MTA operations.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Cultural Resources	No significant adverse impacts to cultural resources are expected provided that the two nearby archaeological sites are tested for significant subsurface deposits and, if identified, data recovery is performed in accordance with SHPO approval.	No significant adverse impacts to cultural resources are expected provided that the rock shelter is tested for significant subsurface deposits and, if identified, data recovery is performed in accordance with SHPO approval.	No anticipated impacts. No potential cultural resources have been identified in the area.	No anticipated impacts. No potential cultural resources have been identified in the area. An archaeologist would be on site during power line burial/relocation and road construction activities.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Land Use	No significant impact. The UTTR-North is designated for military testing, training, and ordnance disposal purposes. Coordination with ongoing operations conducted adjacent to the site would be necessary.	No significant impact. The UTTR-North is designated for military testing, training, and ordnance disposal purposes. Coordination with ongoing operations conducted adjacent to the site would be necessary.	No significant impact. The UTTR-North is designated for military testing, training, and ordnance disposal purposes. Coordination with ongoing operations conducted adjacent to the site would be necessary.	No significant impact. The UTTR-North is designated for military testing, training, and ordnance disposal purposes. Coordination with ongoing operations conducted adjacent to the site would be necessary.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.

Table 4-5. (continued)

Environmental Issues	CBU Valley Proposed Action	Doyle's Gulch Alternative Action	M-60 Range Alternative Action	Round Mountain Alternative Action	No-Action Alternative
Noise	No significant impact. The existing TTU noise abatement plan would be followed to ensure no adverse impacts to off-site receptors in populated areas.	No significant impact. The existing TTU noise abatement plan would be followed to ensure no adverse impacts to off-site receptors in populated areas.	No significant impact. The existing TTU noise abatement plan would be followed to ensure no adverse impacts to off-site receptors in populated areas.	No significant impact. The existing TTU noise abatement plan would be followed to ensure no adverse impacts to off-site receptors in populated areas.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Health and Safety	No anticipated impacts. Existing TTU operating and safety procedures would be followed for all OB/OD activities. Health risks associated with OB/OD emissions would not exceed acceptable levels.	No anticipated impacts. Existing TTU operating and safety procedures would be followed for all OB/OD activities. Health risks associated with OB/OD emissions would not exceed acceptable levels.	No anticipated impacts. Existing TTU operating and safety procedures would be followed for all OB/OD activities. Health risks associated with OB/OD emissions would not exceed acceptable levels.	No anticipated impacts. Existing TTU operating and safety procedures would be followed for all OB/OD activities. Health risks associated with OB/OD emissions would not exceed acceptable levels.	Increased safety risks due to prolonged storage of munitions prior to demilitarization.
Transportation	No significant adverse impacts. Road closures would occur at UTTR-North, but only during OB/OD activities.	No significant adverse impacts. Road closures would occur at UTTR-North, but only during OB/OD activities.	No significant adverse impacts. Road closures would occur at UTTR-North, but only during OB/OD activities.	No significant adverse impacts. Road closures would occur at UTTR-North, but only during OB/OD activities. Lambert Boulevard would be upgraded under this alternative.	No anticipated impact. There would be no changes to existing facilities at UTTR-North.
Socioeconomic Conditions	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.
Environmental Justice	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.

Notes:

MTA = Motor Treatment Area

UTTR-North = Utah Test and Training Range – North

TTU = Thermal Treatment Unit

OB/OD = Open Burn/Open Detonation

5.0 LIST OF PREPARERS

Kay Winn, NEPA Program Manager, Hill AFB, Utah.

Mary DeLoretto, Senior Engineer, Radian International, Salt Lake City, Utah.

Chad Wocken, Engineer, Radian International, Salt Lake City, Utah.

Jim Coletta, Staff Geologist, Radian International, Salt Lake City, Utah.

Steve Barnard, Senior Staff Scientist, Radian International, Research Triangle Park, North Carolina.

Kyra Sexton, Staff Engineer, Radian International, Oak Ridge, Tennessee.

John Kovski, Senior Engineer, Radian International, Houston, Texas.

6.0 LIST OF PERSONS CONTACTED

Brook Arkush, State Permitted Archaeologist, Weber State University, Ogden, Utah, 801-626-7202.

Marcus Blood, Natural Resource Manager, Hill AFB, 801-777-4618.

Bruce Evans, Chief, Environmental Law Branch, Hill AFB, 801-777-2847.

Jose Garcia, Environmental Engineer, Utah Division of Air Quality, 801-536-4000.

Mike Graziano, Air Quality Division, Hill AFB, 801-777-1449.

Debbie Hall, Cultural Resource Manager, EMC, Hill AFB, 801-775-5226.

William Helmrich, Senior Engineer, Naval Strategic Systems Program, 703-607-3357.

Michael Johnson, Project Engineer, Naval Surface Warfare Center - Crane, Demilitarization R&D Office, 812-854-5665.

Michael Kordich, Senior Mechanical Engineer, Naval Surface Warfare Center, Dahlgren Division, 540-653-7534.

Jim Muck, U.S. Fish & Wildlife Service, Utah Field Office, Salt Lake City, Utah, 801-524-5001.

Terry Olsen, UTTR- North Range Safety Officer, Hill AFB, 801-777-1581.

Jim Parrish, Utah Partners in Flight Coordinator, Division of Wildlife Resources, Salt Lake City, Utah, 801-538-4788.

Dean Pollet, Physicist, Naval Surface Warfare Center, 540-653-7956.

Laura Romin, U.S. Fish & Wildlife Service, Utah Field Office, Salt Lake City, Utah, 801-524-5001.

Allen Schoedl, State Certified Archaeologist, P-III Associates, Salt Lake City, Utah, 801-467-5446.

Ronald Short, Civil Engineering Superintendent, UTTR-North, Hill AFB, 801-777-1547.

Jeff Watkins, Air Quality Division, Hill AFB, 801-777-6910.

Dennis Weder, Range Environmental Coordinator, Hill AFB, 801-775-6921.

7.0 REFERENCES

- CH₂MHill. *Closure/Post-Closure Plan for UTTR Landfill No. 5, Hill Air Force Base*. 1988.
- CH₂MHill. *Environmental Assessment – Open Burning of Titan IV Rocket Motors Utah Test and Training Range Thermal Treatment Unit*. 1992.
- CH₂MHill. *Final Environmental Assessment for M60 and M203 Firing Range Relocation in the Utah Test and Training North Range*. 1996.
- CH₂MHill. *Final Inclination Survey of Landfill 5 Monitoring Wells and Cap Maintenance Report*. 1999
- Core Laboratories. *Core Analysis Report performed for: Radian International - Project DO 5086*. 1997.
- Dames & Moore. *Environmental Assessment for Disposal of C-3 Poseidon 2nd Stage Rocket Motors at UTTR, Utah*. 1994.
- Dames & Moore and Foster Wheeler Environmental Corporation. *Final Range Management Plan and Environmental Assessment for the Hill Air Force Base Range and Wendover Air Force Range of the Utah Test and Training Range*. 1997a.
- Dames & Moore and Jaycor. *Sound Studies of Open Burn and Open Detonation at Utah Test and Training Range*. 1997b.
- Dames & Moore. *A Cultural Resource Inventory of a Proposed Rocket Motor Treatment Area*. 1999a.
- Dames & Moore. *Potential Noise Effects on Nesting Golden Eagles, A Literature Review*. Completed for Radian International. 1999b.
- Department of Environmental Quality Division of Solid and Hazardous Waste. *Draft Permit Writers Guidance for Open Burning and Open Detonation (OB/OD) Treatment Facilities*. 1996.
- Doelling, H.H. Bulletin 115, "Geology of Box Elder County, Utah." Utah Geologic and Mineral Survey, Utah Department of Natural Resources. 1980.
- Enviro-Support, Inc., ARINC, Digit Lab, and University of Utah. *Draft - Range Management Plan and Environmental Assessment for the Utah Test and Training Range (UTTR)*. 1998.
- Grubb, T.G., and R.M. King. "Assessing Human Disturbance of Breeding of Bald Eagles with Classification Tree Models" *J.Widl.Manage.* 55(3):500-511.
- Hecker, S. Bulletin 127, *Quaternary Tectonics of Utah with Emphasis on Earthquake-Hazard Characterization*. Utah Geologic Survey, Utah Department of Natural Resources. 1993.
- Hill Air Force Base. *Final - Ambient Air Quality Risk Assessment for the Thermal Treatment Unit (TTU) at the Utah Test and Training Range*. 1996.
- National Defense Industrial Association (NDIA) 1998 Global Demilitarization Symposium and Exhibition Synopsis. Coeur d'Alene, Idaho.

Naval Surface Warfare Center. *Sound Intensity Prediction System (SIPS)*. Volume 1, Reference Manual. Dahlgren Division Naval Surface Warfare Center. 1997.

Naval Surface Warfare Center. *1998 Technology Update Summary*. 1998.

Parsons Engineering Science, Inc. *Final Wetland/Mudflat Management Plan, Utah Test and Training Range, Utah*. 1995.

Pater, L. *Noise Abatement Program for Explosive Operations at NSWC/DL*. Presented at the 17th Explosives Safety Seminar of the Department of Defense Explosives Safety Board. 1976.

Price, D. and Bolke, E.L. Technical Publication No. 26, *Hydrologic Reconnaissance of The Sink Valley Area Tooele and Box Elder Counties, Utah*. U.S. Geologic Survey, Utah Department of Natural Resources. 1970.

Radian Corporation. *Draft Final - Description of Current Conditions, Hill Air Force Range, Utah*. 1995.

Radian International, LLC. *Final Draft - Resource Conservation and Recovery Act Part B Permit Application for Open Burning/Open Detonation at the Utah Test and Training Range-North Thermal Treatment Unit*. 1997.

Radian International, LLC. *Draft – Preliminary Risk Assessment for Thermal Treatment Units at Utah Test and Training Range*. 1998a.

Radian International, LLC. *Notice of Intent - Motor Treatment Area Utah Test and Training Range Hill Air Force Base, Utah*. 1998b.

Radian International. *90% Draft - Environmental Assessment for the Treatment of 42,000 Pounds NEW at the Thermal Treatment Unit Utah Test and Training Range*. 1999a.

Radian International. *Final - Experimental Demonstration Tests at the Proposed Motor Treatment Area, Utah Test and Training Range*. 1999b.

Romin, L.A. and Much, J. *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances, U.S. Fish and Wildlife Services, Utah Field Office*. 1999.

U.S.A.F. Air Force Instruction 32-77061. *The Environmental Impact Analysis Process*. 1995.

U.S.F.W. 1999.

Workman, G. W. *Natural Resource Management Plan for the Hill Air Force Base Range, Wendover Air Force Range and Little Mountain Test Facility, Utah*. 1992.